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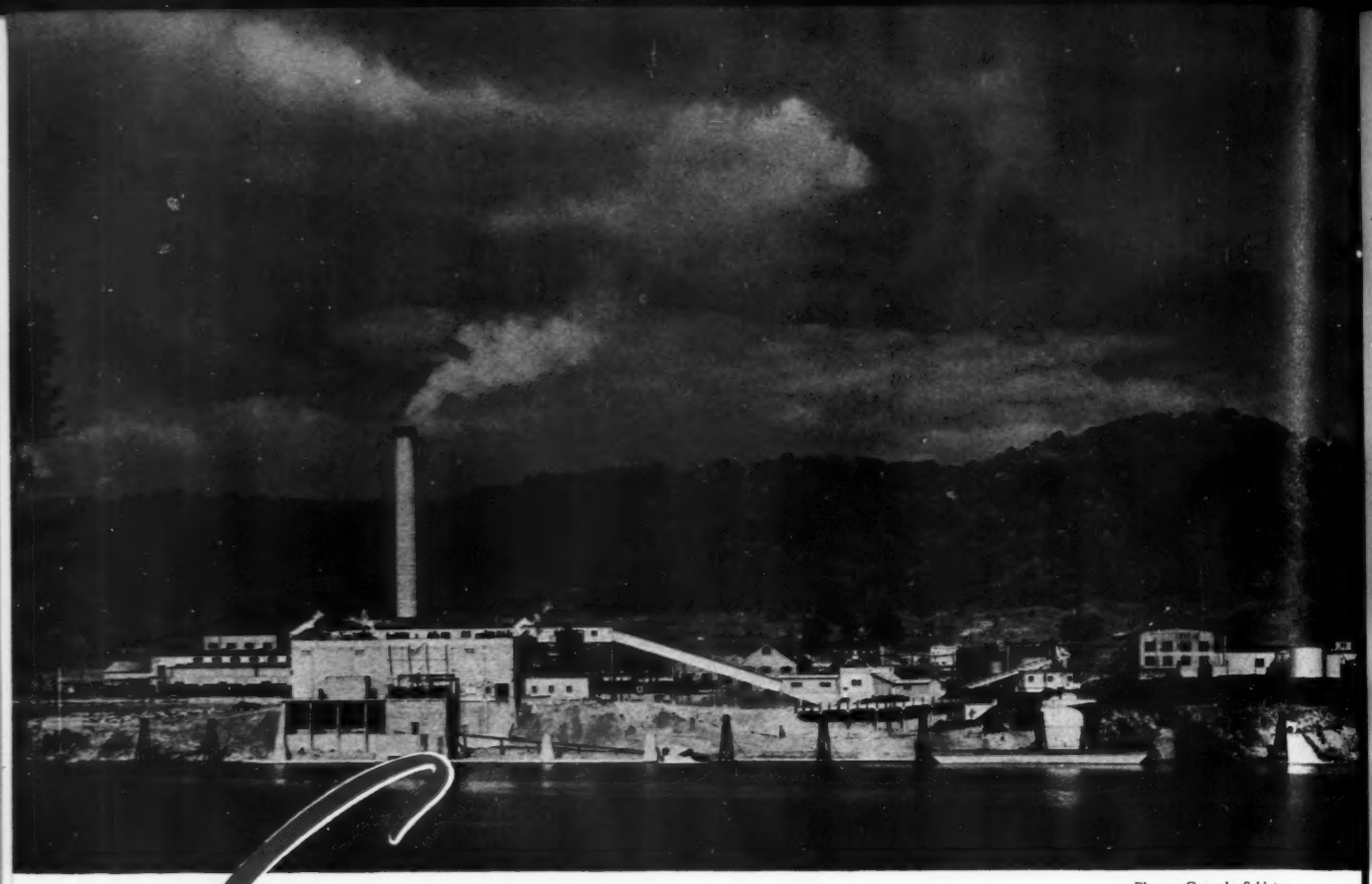

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THE OIL AND GAS JOURNAL

Peacetime Emergencies

THE rail and coal strikes are an answer to those who, in the past, have attempted to arrest the progress of the petroleum and natural-gas industries in the field of transportation and in the efficient distribution of fuel products. As some radio and press commentators have pointed out, the petroleum and natural-gas services have constituted the only real protection the public has had in the ruthless efforts of union leaders to gain their objectives by bringing economic chaos to an entire nation.

As hundreds of trains marked time last week the 142,000 miles of crude-oil and product lines in this country continued their deliveries and as a result, activities dependent on petroleum for light, heat, and power continued normal. Outstanding was the importance of product lines.

Developments recalled the complaints, starting fifteen years ago, when the initial large gasoline lines were built. Railroad operators and their unions contended that the lines were an unnecessary duplication of their facilities. Fortunately oil companies went ahead and built the first systems and established their position as an economical method of transporting products from refineries to consuming centers.

Inland water transportation of petroleum is an important supplementary phase of the product pipe lines. During the latter part of the war these facilities expanded until approximately one-third of the movement of crude oil and products within the United States included water shipments. Tank-wagon deliveries from refineries and pipe-line and water terminals are an integral part of these operations. The net result is that large areas in this country are now independent of rail deliveries so far as gasoline is concerned.

A comparable situation exists in the distribution of natural gas and that fact should be forcefully brought to the attention of the Federal Power Commission as it concludes its investigation of the natural-gas industry at Washington. FPC has been concerned about the competition of coal and gas and has attempted to restrict the expansion of natural-gas lines.

And yet the coal strike demonstrated that except for natural gas hundreds of industrial plants and utilities would have been shut down within a few days after the mines closed. Furthermore, millions have had the satisfaction of knowing that regardless of what happened they would have sufficient natural-gas fuel for their homes.

So again the petroleum and natural-gas industries have responded to a national emergency with their many services. Continued growth over the next few years will mean that the federal Government to avert a national calamity in a coal or rail labor crisis will not be confronted with the necessity of asking for powers which have no proper place among free peoples.

World Oil Production, Demand in June to Exceed Wartime Peak

WORLD petroleum production and demand in June will be greater than during the peak of the war period and probably will include an all-time record output for the United States, according to estimates made the first of the week by members of The Oil and Gas Journal editorial staff in touch with projected domestic and foreign operations. These maximum operations in prospect for the new month which starts Saturday reflect an upward trend in demand which has been under way for several weeks and to which no immediate ending is in sight. They nullify the analyses of many economists who had predicted substantial decreases in domestic and total world demands by midyear compared to the requirements just before the cessation of the Japanese War in August last year.

The largest indicated crude-oil production of the war period was for the week ended August 11, last year, when domestic output averaged 4,933,600 bbl. daily. After the close of the war, there was a decline of approximately 450,000 bbl. daily by late September from this record United States output. Operations were further curtailed temporarily during the strike period last fall. Since the first of the year with the exception of the month of March the trend in domestic crude-oil production has been upward. During March, crude-oil production was reduced due to a curtailment in Texas output. The Bureau of Mines estimated domestic demand for May was 4,626,000 bbl. daily but this output has been exceeded all month, the crude-oil output for the week ended May 25, averaging 4,776,120 bbl. daily.

Most of the changes in national crude-oil output in recent months have been accounted for by the variations in Texas production. The output of the Lone Star State averaged approximately 65,000 bbl. daily in excess of the Bureau of Mines estimate in May. The Texas Railroad Commission last week, following a demand hearing, announced a production schedule for Texas which, if carried out, will mean that the state's crude-oil output in June will average 2,293,092 bbl. daily. This will be a record production for the state and 70,000 bbl. daily greater than the production for the week of August 11, 1945.

Outside Texas the most important change in crude-oil production since the close of the Japanese War has been in California where last week's output was approximately 75,000 bbl. less than the August peak of last year. This decline has been largely offset by small increases in several states outside Texas, the most important of which are the gains in Colorado and Louisiana.

No significant changes in national output outside Texas are in prospect for June. The demands in all the oil-producing states are strong and small increases in June over May are in prospect in states where additional output is available. Owing to these conditions and with the large increase scheduled for Texas, national crude-oil output will average approximately 4,950,000 bbl. daily in June. This figure does not include condensate and natural-gasoline production.

World Situation

Outside the United States the trend in several countries has been upward for several months with no important reductions reported. The current output of Venezuela is estimated to be 1,050,000 bbl. daily, an output which exceeds the peak war production. There has also been a small increase in Colombian production in recent weeks.

Middle East production is now estimated to be about 700,000 bbl. daily. The largest gain has been in Saudi Arabia where the production has increased from 75,000 bbl. daily a year ago to 170,000 bbl. daily at this time. Production in Iran, which is also largely located on the Persian Gulf, has also increased and is now reported to exceed 400,000 bbl. daily. In the Far East the rehabilitation of oil properties has not materialized as fast as had been expected but present output is greater than when the Japanese conflict ended. European production outside the U.S.S.R. and Romania is unimportant in world totals. Romania production is estimated at 100,000 bbl. daily with no information available on U.S.S.R. output. World crude-oil production exclusive of the United States and the U.S.S.R. is estimated to be 2,340,000 bbl. daily.

Exports and Imports

While some economists feel that the record output in Texas for June will not continue over the remainder of the year there are now no predictions of a substantial decline in petroleum demands for either domestic or foreign distribution. Exports from this country are estimated to be approximately 400,000 bbl. daily not including U.S. Navy and UNRRA requirements. The bulk of the exported crude oil is going to Canada and Cuba and most of the products consisting largely of gasoline to the United Kingdom and Western Europe.

Imports in March, the latest official report, averaged 320,200 bbl. daily. Most of these imports came from Venezuela and the neighboring refineries of the Netherlands West Indies which operate with Venezuelan crude oil.

Demand

Various reasons are assigned for the unexpectedly large increases in domestic demands. There is agreement that the projected postwar demands for gasoline have been much too low.

The answer seems to be that the old jallopies are better than anyone thought. Tires are no longer a problem, and apparently there are sufficient repair parts and mechanics to keep the cars running. Though the number of passenger cars registered is below prewar, they are being used more, for a wide variety of reasons. Trains are so crowed people travel and take vacations by auto. City workers go to work by car to avoid jammed street cars and buses. Discharged servicemen have the urge to drive some place. Displaced warplant workers have been migrating to new jobs or just traveling around. Unemployment is far less than the pessimistic estimates of V-J Day, and plenty of people have plenty of money to spend. A nation on wheels seems determined to keep 'em rolling.

Gasoline consumption by commercial vehicles is also somewhat above estimates, because a good many surplus Army trucks have got into circulation and civilian production of trucks and buses was not much delayed by factory reconversion problems. Nonhighway use of gasoline is up considerably above last fall's estimates, chiefly in agriculture. Not only are more tractors being used longer hours on more acres than before the war, but new gasoline engine tractors have replaced many old models which burned kerosene or fuel oil.

Military demand for all petroleum products has been just about what the services estimated except for last winter's difficulty in obtaining Navy special fuel oil for the hastily improvised "Magic Carpet" operation of using high-speed combat ships to return soldiers and sailors from overseas. Demand for bunker oil by War Shipping Administration has been somewhat above early estimates, due to heavy UNRRA and other relief shipments which perhaps should have been but were not fully anticipated.

Nonmilitary export demands are also running above expectations, due to the European coal shortage and other factors, and probably will continue high since foreign refineries are incapable of much early expansion.

A cool but pleasant spring in most parts of the country prolonged the heating season, adding to the consumption of both heating oils and passenger-car gasoline. The coal strike probably had some effect in increasing fuel-oil consumption to the extent that users were able to switch fuels, and will be felt even more next winter since most new houses and many old ones are expected to be equipped with oil burners instead of coal furnaces by the time the next heating season arrives.

What with one thing and another, petroleum products demands during the first quarter of 1946 were far above last fall's estimates. For a while the prognosticators thought this was due mainly to making up stock losses caused by the refinery strike, but the high demand is continuing in the second quarter. However, second-quarter consumption is not expected to be as far above the early estimates as the first quarter was, and actual performance the third quarter may come much closer to the estimates. This is because the third quarter is always the peak in gasoline consumption, and it is unlikely that the peak can be expanded as much as was a normal slack period last winter and early spring.

House Approves Program to Develop Naval Reserve No. 4 in Alaska

by Henry D. Ralph

WASHINGTON.—A 3-year program for development of naval petroleum reserve No. 4 in Alaska, estimated to cost $9,600,000, was approved by the House in passing the Navy Department appropriation bill last week.

The program, which has been worked out in detail by the Navy and approved by the President, calls for extensive geologic work and drilling several wells in the hope of developing a field of major proportions.

Authorization goes no further than that, but if substantial production is found the Navy will submit a plan for commercial development of the area. Tentative suggestions for such development include a government-owned common-carrier pipe line to a warm-water port in southern Alaska, and invitation to oil companies to drill in the reserve. Contracts whereby oil taken from Alaska for commercial use would be traded for an equal volume of proved reserves in continental United States for future Navy use, and possibly a subsidy to permit Alaskan oil to reach San Francisco refineries on a competitive basis with crude from California fields.

No plan for commercial development will be submitted to Congress until exploratory work has demonstrated that a substantial settled production can be maintained, perhaps 100,000 bbl. per day.

Although the Navy started Alaskan work 2 years ago with its own personnel, its Seabees have now been disbanded and work will be continued under private contract. Elaborate precautions have been taken to avoid charges of mismanagement or repetition of the Army's Canol experiment.

The firm of DeGolyer & MacNaughton has been retained as special advisers. The exploration and drilling contract has been let to Hoover, Curtice & Ruby, Inc., and construction and supply will be handled by the contracting firms of F. C. Lytle Co. and Green Construction Co. of Des Moines, Iowa, who built Alcan Highway. Surface work will be conducted by U. S. Geological Survey. Comdr. W. G. Greenman, director of Naval Petroleum Reserves, is advised by a special board consisting of L. W. MacNaughton; A. H. Chapman of Hoover, Curtice & Ruby, former PAW official; W. E. Wrather, head of U.S.G.S., and Comdr. H. C. Shaid, of Navy Bureau of Yards and Docks.

To Use Airborne Magnetometer

At present only parts of the eastern third of the reserve have been explored but there are oil and gas seeps in many places. The entire area will be surveyed by airborne magnetometer, aerial photography, geological surface mapping, subsurface reconnaissance by gravity meter and seismograph and core drilling in selected spots, and finally wildcat drilling.

Plans for this summer call for completing to 6,000 ft. the well at Umiat Mountain stopped last fall at 1,900 ft., and completing geophysical work at Cape Simpson and starting a well there if the geology proves favorable. Also airfields, barracks, and warehouses will be constructed and supplies moved for future operations. At least one other well will be drilled in the Umiat structure, which covers 15 or 20 sq. mi., and if oil is found in commercial quantities, about 15 or 20 wells will be drilled and capped to delineate the field. But the present program calls for drilling only seven or eight wells in scattered locations, taking cores every 50 or 100 ft. Two geophysical crews, as well as aerial and surface survey parties, will be at work each summer. The program is scheduled for completion in the fall of 1949, by which time the Navy believes it will know roughly the extent of its Alaska reserves. On the basis of present information officials believe it has greater potentialities than any undeveloped area of the world.

Chicago Corp. Acquires Interest in Loffland

THE Chicago Corp. has acquired a substantial interest in Loffland Brothers Co., the industry's largest drilling-contracting firm, H. L. Sullivan, of the Loffland company, announced Tuesday.

Policies and management of the Loffland company will continue unchanged with T. F. Loffland as chairman of the board and Sullivan as president. Loffland Brothers Co. at this time operates 108 drilling rigs in domestic and foreign fields and has crude-oil-producing properties in various areas.

The Chicago Corp., originally a securities company, entered the oil and gas business several years ago and now has holdings in Texas, including two cycling plants in the Corpus Christi area.

Wilson Challenges Porter On Decontrol Statements

CHICAGO.—Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Indiana) last week challenged statements of Paul A. Porter, Office of Price Administration head, that the coal strike justifies deferment of decontrol of the oil industry.

In a letter to the chairman of the Senate banking and currency committee, Dr. Wilson asserted Porter's prediction of a 100 per cent rise in industrial fuel oil prices if control were lifted is "100 per cent ridiculous."

Dr. Wilson declared that the strike has had practically no net effect on the supply and demand relationship regarding gasoline, that kerosene stock accumulation is proceeding at a higher rate than normal, that distillate stocks are similarly accumulating more rapidly than normal, and that substitution of fuel for coal cannot take place on a large scale in a short period.

New Company Buys Capital Stock of J. S. Abercrombie

HOUSTON.—Consummation of one of the largest oil deals in Gulf Coast history was announced here last week.

An official statement announcing the transaction follows:

"The Old Ocean Oil Co., a recently organized Delaware corporation with offices in the Gulf Building, announced Thursday that it had purchased from J. S. Abercrombie and associates all of the capital stock of J. S. Abercrombie Co., a Texas corporation, and that its officers had assumed active management of the company.

"The J. S. Abercrombie Co., organized in 1924 by J. S. Abercrombie of Houston, has for years been one of the most successful Gulf Coast oil operators. It is one of the principal owners of the Old Ocean field in Brazoria County, Texas, where, with Magnolia Petroleum Co., it operates a large recycling and extraction plant, and has extensive holdings in Conroe and East Texas and numerous other fields in Texas, as well as in Hackberry, Calcasieu Parish, and other parishes in Louisiana."

The total consideration paid by Old Ocean Oil Co. for the stock of J. S. Abercrombie Co. was not announced, but it was stated that the consideration was in cash.

Old Ocean Oil Co. also announced that, in connection with financing the purchase, it had borrowed $30,000,000 from Guaranty Trust Co. of New York and Chemical Bank & Trust Co. of New York on 10-year notes, and had placed with Stanolind Oil & Gas Co. an issue of 20-year debentures in a substantial amount.

The largest stockholder in Old Ocean Oil is Lloyd Noble of Ardmore, Okla. Noble is a prominent oil producer, drilling contractor, and rancher, and is well known throughout the oil industry. Associated with him as stockholders are Carlton R. Winn, Dallas, and Harry C. Weeks, Fort Worth.

Butler in Direct Charge

The operations of the new enterprise will be under the direct charge of J. R. Butler as vice president and general manager. Butler for the past several years has been general manager of the Cotton Valley and Haynesville units and recycling plants in northern Louisiana.

These operations are similar to those conducted by the Abercrombie company in Old Ocean field. The directors of Old Ocean Oil Co. are Lloyd Noble, J. L. Cleveland, J. R. Butler, Carlton R. Winn, and Harry C. Weeks. The new board of directors of J. S. Abercrombie Co. are J. R. Butler, Carlton R. Winn, Harry C. Weeks, Lloyd Noble, and J. P. Roetzel.

It was emphasized in the announcement that, while the former senior officers of J. S. Abercrombie Co. had resigned, the new management intended to make no radical changes in office and field employes and that general offices would continue at Houston.

In the official statement concerning the transaction, no price was given, but it was widely reported in oil circles that the transaction involved in the neighborhood of $50,000,000.

Negotiations, which have been carried on for several months, were concluded here Thursday with the signing of final papers by both groups. The two groups, including prominent New York bankers, met at the National Bank of Commerce to close the deal.

The Old Ocean field, in southwestern Brazoria County, has produced more than 35,000,000 bbl. of oil and its reserves were estimated at 24,100 bbl. per acre on January 1, 1945. There are about 15,000 acres of proven production in the field, which was discovered in November of 1934. Production is from deep Frio formations, with the oil-bearing sands ranging from 8,600 ft. to 11,000 ft. Thickness of the producing formation is in excess of 350 ft., regarded as one of the richest in this area.

During the war, the Abercrombie company operated a government-owned refinery near the recycling and extraction plant in Old Ocean field. The plant was shut down shortly after V-J day. Its capacity is listed at 18,000 bbl. crude oil daily, and 4,700 bbl. thermal cracking. Fluid catalytic cracking capacity is 13,000 bbl. daily. The hydrofuoric acid alkylation unit has a 4,000-bbl. daily capacity. Isomerization production capacity is 1,500 bbl. daily.

Capacity of the natural gasoline plant operated by Abercrombie and Magnolia Petroleum Co. is 240,000 gal. daily.

Lloyd Noble, largest stockholder in Old Ocean Oil Co.

J. R. Butler, vice president and general manager of new company

Microbiologist Describes Possible Uses of Bacteria

OIL CITY, Pa.—The possibilities of use of bacteria in relation to recovery of petroleum are significant, Dr. Jay V. Beck, microbiologist for the Pennsylvania Grade Crude Oil Association, told the Rotary Club here last week.

Ways in which bacteria may aid in oil recovery, he explained, consist of: Dissolving carbonates; joining onto the sand body and forcing out the oil globule; producing carbon dioxide which, by pressure, would force out the oil and decrease viscosity of the oil, tending to make it flow more readily; and producing wetting agents which would more efficiently cleanse the sand grains of the adhering oil film.

THIS 1946 WEEK

S	M	T	W	T	F	S

PRODUCTION—Survey indicates domestic and foreign production will hit all-time peak in June. . . . U. S. output expected to average 4,950,000 bbl. daily after record high Texas allowable of 2,293,000 bbl. daily takes effect. . . . ¶Crude production for week ended May 25 gains 17,970 bbl. to 4,776,120 bbl. daily. . . . Crude stocks increase 498,000 bbl. in May 18 week. . . . First crude stock rise since mid-April. . . . ¶Bureau of Mines report shows daily average production of natural gasoline and allied products in March declined 7 per cent from February. . . . Drop regarded as largely seasonal. . . . ¶Louisiana allowable effective June 1 increased state's production 10,639 bbl. to 417,814 bbl. daily. . . .

LABOR—Tank-car movements returning to normal following last week's rail tieup. . . . Strike brought runs on filling stations in some localities, including District of Columbia. . . . No serious oil shortages reported before end of walkout Saturday. . . . ¶Some industries again turning to auxiliary oil-burning equipment as a result of new coal emergency. . . . Vice Admiral Moreell, who handled struck oil plants seized last fall, takes over government control of the coal industry. . . . ¶Return of Gulf's Toledo plant, last of the 53 seized oil installations, imminent. . . .

PRICES—Dr. Robert E. Wilson, Indiana Standard board chairman, brands as "ridiculous" statements of Paul Porter, OPA head, that coal strike justifies delay in oil decontrol. . . . Calls on Congress to remove "blighting hand of price control" in letter to Senate committee. . . . ¶OPA asks return of its industry questionnaires for further decontrol study. . . . Agency officials say decontrol will again be considered if coal, rail strikes clear and gasoline prices stay below ceiling. . . . ¶OPA reported planning to lift ceilings from oil-well equipments early next week. . . . ¶Mid-Continent gasoline market strong with regular at 5 1/2 cents and up. . . . Indications point to another possible advance in natural gasoline. . . .

REGULATION—Some industry officials reported shying away from all-out participation on advisory committee to new Oil and Gas Division. . . . Justice Department studies "clearance" on question. . . . Meeting of new industry group slated in June. . . . ¶Rehearing opens in Wichita on Kansas Corporation Commission's order setting 40-acre proration spacing for deeper pools. . . . ¶Texas Railroad Commission sets hearing June 19 on requiring electric logs for all completions. . . .

TRANSACTIONS—New company, Old Ocean Oil, buys stock of J. S. Abercrombie Co. in Gulf Coast transaction reportedly involving $50,000,000. . . . New company is headed by Lloyd Noble, independent producer and drilling contractor. . . . S. Julius Fohs discloses he and other major stockholders are selling stock in Fohs Oil to Texas Gulf Producing Co. . . .

REFINING—CPA due to announce 4,100-ton June tetraethyl lead allocation this week. . . . Order sets top octane of 78.5 on premium gasoline. . . . Another meeting with Reconversion Director Snyder scheduled on problem of increasing nation's over-all lead supply. . . .

A coal crisis again faced the nation early this week, and for a second time coal-using industries turned to oil to sustain them in the emergency. Here are oil tank cars, each of 10,000 gal. capacity, after arrival at Commonwealth Edison Co.'s plant in Chicago. This utility is using oil in partial replacement of its dwindling coal supply. Another major utility, Consolidated Edison Co. of New York, Inc., disclosed it is generating about 25 per cent of its electric output with oil during the coal emergency. Consolidated Edison said deliveries of oil must continue if its electric output is to remain at present levels. (Photo by Acme)

New officers of the National Oil Scouts and Landmen's Association, chosen at the twenty-third annual meeting of the organization last week in Jackson, Miss., include the group shown left. They are H. J. Roberts, Houston, editor-in-chief; J. O. Phipps, Evansville, Ind., secretary-treasurer; S. S. Stinson, Midland, Tex., president; and Henry P. Evans, Wichita, Kans., second vice president. Below are three of the association's retiring officers: F. D. Johnson, Corpus Christi, Tex., retiring first vice president; H. F. King, Ardmore, Okla., retiring president; and H. L. Johns, New Orleans, retiring chairman of the association's board of directors

Industry Still Shackled With War Restrictions, Oil Scouts Told

JACKSON, Miss.—Formulation of a national import policy by Congress for the economic protection of the domestic petroleum industry is an immediate need, B. A. Hardey, of Shreveport, La., president of the Independent Petroleum Association of America, told the National Oil Scouts and Landmen's Association at its twenty-third annual meeting here, May 23, 24, and 25.

A record-breaking number of more than 400 scouts and landmen attended the annual meeting, surpassing the previous attendance record set in 1939 at Houston. No decision was made on the date or location of the next annual meeting.

With the observation that the oil industry is "still shackled with war restrictions," Hardey said that the industry "cannot do the job under the present conditions."

He also stressed the importance of sound conservation practices in the oil producing areas, asserting that it was of more interest to the individual states to practice conservation because of the benefits derived from oil production.

An interesting paper on the geology of Mississippi was given by Clyde W. Alexander, Dixie Geological Service, Jackson.

"A total of 29 piercement salt domes," Alexander said, "have been proven by drilling to occur in the basin (Mississippi salt basin). The depth range to top of the salt on these domes is from 736 ft. on the Richton dome in Perry County to 5,100 ft. on the Newman dome in Warren County.

"Most of the domes have been, or are being, explored for flank production by deep tests, all of which have failed to date, although several oil showings have been noted. The inadequate quantity of low gravity oil has not allowed commercial production.

"Two gas fields have been discovered overlying piercement domes with production in each case coming from sands of Claiborne age—they are Bruinsburg field of Claiborne County and Kings field of Warren County. The complex structural conditions on these domes will make development slow and hazardous with a lot of 'head scratching' between locations.

"Several domes have been extensively explored for possible sulfur deposits but to date all reports indicate that no more than slight traces have been found on three domes.

"The stratigraphic sequence of producing rocks in Mississippi fields is from the Claiborne sands on the two piercement domes; Wilcox sands at Cranfield and potentially at Baxterville; the Selma 'gas rock' in Tinsley, Flora, Cary, and Jackson; the Eutaw at Tinsley, Pickens, Eucutta, Heidelberg Gwinville, Baxterville, Langsdale, Soso, and Quitman; the upper Tuscaloosa at Tinsley, Heidelberg, Gwinville, Baxterville, and Hub; the lower Tuscaloosa 'massive sand' zone at Brookhaven, Cranfield, one well at Heidelberg, one well at Gwinville, Mallalieu, Baxterville, Carthage Point, Hub, Fayette, and LaGrange.

"The Hub and Cranfield fields both have deep tests now in operation, which should extend the productive limits into the Comanche.

"Few tests have penetrated Cotton Valley and Smackover formation and all have failed to find production. Oil shows were noted in tight Smackover lime in a deep test at Tinsley and in Issaquena County, but failed to 'give up' on production tests.

"The producing structures in Mississippi fall in three principal categories (1) the simple unfaulted uplifts (Cranfied, Carthage Point, Fayette); (2) the fault line production (Pickens, one well Quitman field, and Langsdale); (3) the more complexly faulted structures such as Heidelberg, Eucutta, Gwinville, and Baxterville. Each of these fields is associated with graben fault structures which are similar to many South Louisiana deep seated salt dome fields."

H. H. Kaveler, Phillips Petroleum Co., Bartlesville, Okla., read a paper on principles of cycling operations.

Declaring that "condensate has grown to be significant in volume of production," Kaveler said that in 1945 there were 41 cycling plants in operation in the United States and the daily average production from these plants was 88,200 bbl. He added that there are approximately 250 pools in the country classified as gas-condensate reservoirs.

"In my opinion, he said, "the basic and underlying fundamental fact is recognition of the truth that petroleum does not produce itself from sub-

surface reservoirs, but rather, is produced through the agency of either or both natural gas or encroaching water. Liquid petroleum is recovered from wells because it is expelled from reservoirs into well bores by natural gas or encroaching water under pressure.

"The facts dictate clearly," he said in conclusion, "that pressure maintenance operation is necessary whereby the volume of gas taken from the pool is balanced by the injection of an equivalent volume of either gas or water, or both, or, balanced by the equivalent volume of water encroachment under natural water drive.

"The necessity for pressure maintenance operation further dictates that the operation should be carried on under unit management. This is the direction in which the industry is moving. The general features of unit operation are known to you. The main problems involved are usually two. One is that of convincing all of the owners in interest in such a pool that unitization is essential and will result in maximum benefit; the second is the problem of accomplishing a fair distribution of equities in the unit operation."

S. S. Stinson, Midland, Tex., divisional scout for Humble Oil & Refining Co., was elected president of the association by acclamation, succeeding H. F. King, Ardmore, Okla., Continental Oil Co.

Other officers elected were: S. M. Jackson, Sun Oil Co., Shreveport, La., first vice president, succeeding F. D. Johnson, Superior Oil Co., Corpus Christi, Tex.

Henry P. Evans, Skelly Oil Co., Wichita, Kans., second vice president, succeeding Hal C. Walker, Ohio Oil Co., Casper, Wyo.

J. O. Phipps, Superior Oil Co., Evansville, Ind., secretary-treasurer, succeeding R. M. Knoepfel, Atlantic Refining Co., Carlsbad, N. M.

H. J. Roberts, Gulf Refining Co., Houston, Tex., editor-in-chief, succeeding W. G. Sinclair, Gulf Oil Corp., Wichita Falls, Tex.

King, the retiring president, is automatically elevated to chairman of the board of directors, succeeding H. L. Johns, Freeport Sulphur Co., New Orleans.

Program Outlined for A.P.I. Production Meeting at Oklahoma City

OKLAHOMA CITY.—Secondary recovery, unitization, drilling muds, and the international oil outlook are among the subjects scheduled for discussion here June 6-7 at the spring meeting of the Mid-Continent district, Division of Production, American Petroleum Institute.

Speakers and subjects listed for the meeting follow:

June 6, morning — "Drilling and Coring Methods in Secondary-Recovery Operations," R. B. McCloy, Stanolind Oil & Gas Co.; "Rates of Penetration in Hard Formation Drilling," J. E. Warren and B. R. Schabarum, Carl B. King Drilling Co.; "A New and Improved Drilling Mud," H. H. Kaveler, Phillips Petroleum Co.; and "Pumping Wells With Electric Motors (Operating Features of Electric-Motor Drives and Electric-Power Generation and Distribution)", J. H. Field, Sohio Petroleum Co.

Afternoon—"International Petroleum Outlook in Relation to Operations in the United States," C. O. Willson, The Oil and Gas Journal; Unitization and Gas Injection in the South Burbank Pool," L. L. McWilliams, Phillips Petroleum Co.; and "Problems of Unitization," R. M. Williams, Phillips Petroleum Co.

June 7, morning—"Case History of the Efficiency of Natural Water Drives (Illinois)," A. W. Baucum, The Texas Co.; "Efficiency of Natural Water Drive—Ramsey Pool," M. B. Penn, Mid-Continent Petroleum Co.; "Porosity in Limestone and Dolomite Petroleum Reservoirs," W. C. Imbt and S. P. Ellison, Jr., Stanolind Oil & Gas Co.

Afternoon — "Performance of Bodcaw Reservoir, Cotton Valley Field Cycling Project, New Methods of Predicting Gas Condensate Reservoir Performance Under Cycling Operations Compared to Field Data," Marg. Miller and Max R. Lents, Cotton Valley Operators Committee; "The Importance of Injected Gas As a Driving Medium in Limestone Reservoirs as Indicated by Recent Gas Injection Experiments and Reservoir Performance History in Typical Limestone Reservoirs," L. E. Elkins, Stanolind Oil & Gas Co.; "Experience in Cunningham," Colin Rae, Skelly Oil Co.; and "Practical Considerations," Lloyd Gray, Gulf Oil Corp.

Presiding at the sessions will be: C. M. Copeland, Williams-Copeland Drilling Co., and Frank H. Willibrand, Sohio Petroleum Co., morning, June 6; J. S. Montgomery, J. S. Montgomery Drilling Co., afternoon, June 6; W. L. Horner, Barnsdall Oil Co., and J. R. Evans, Stanolind Oil & Gas Co., morning, June 7; and Harold S. Kelly, Phillips Petroleum Co., afternoon, June 7.

Thursday evening, June 6, a sound motion picture entitled "Arctic Oil" will be presented by courtesy of the Navy's bureau of yards and docks. The spring meeting will close with a banquet in the Skirvin Tower Hotel, the evening of June 7. No speakers are scheduled.

Presiding officers, speakers, and discussors will meet at breakfast conferences both mornings in advance of the technical sessions to consider programs for the day. Kelly is program chairman, and Montgomery is chairman of the district.

Fohs Oil Co. to Sell Stock To Texas Gulf Producing

HOUSTON.—S. Julius Fohs, president of Fohs Oil Co., said early this week that he and other large stockholders of the company had agreed to sell their stock in the company to Texas Gulf Producing Co. at $11 per share.

The deal, contingent on Texas Gulf being able to secure 70 per cent of the 768,607 shares of common stock of Fohs Oil Co. by June 10, would consummate one of South Texas' largest oil transactions in some time.

It was generally considered in oil circles that the deal would be consummated and that the consideration would total in the neighborhood of $6,000,000. Stockholders of Fohs Oil Co. were being notified and will have until June 19 to accept the offer of $11 per share.

Texas Hearing Set on Requiring Electrical Logs

AUSTIN.—The question of whether electrical logs should be required on all oil and gas wells completed in Texas will be discussed in a hearing before the Texas Railroad Commission here June 19.

At the same time, the commission is requesting operators to show cause why electrical logs should not be submitted on all completions. Most wells now completed in Texas are electrically logged, and the proposal before the commission is regarded as an indication of the importance of electrical logging methods.

Crude Subsidies Extended

WASHINGTON. — The Office of Price Administration has authorized increases ranging from 5 to 35 cents a barrel in producers' ceiling prices for crude oil from 20 wells in eight states. The increases, retroactive to April 1, affected pools in Kansas, Illinois, Oklahoma, Texas, New Mexico, California, Indiana, and Michigan.

International

WORLD-WIDE OIL DEVELOPMENTS

Romanian Production Still Short of Prewar Total

LONDON.— While Romania's 1945 crude oil production was up to 4,640,000 metric tons (32,480,000 bbl.) compared with 1944's production of 3,512,000 metric tons (24,584,000 bbl.), it still falls far short of the 1938 prewar production of 9,260,000 metric tons (64,970,000 bbl.), according to reliable sources here. Romania's production so far this year has been slightly higher than in 1945.

The bulk of Romania's 1945 crude exports, estimated at 3,100,000 metric tons (21,700,000 bbl.) served as reparations to Russia as well as supplying large Russian military forces still in that country. Of the relatively small amount of crude left for Romanian needs even some of this was exported to adjacent countries.

Domestically, the chief shortage was fuel oil, with only 624,000 tons (4,368,000 bbl.) left in the country in 1945, after deliveries to Russia. This compares with Romania's prewar fuel oil consumption of 1,200,000 tons (8,400,000 bbl.)

Prices received for petroleum products, and the general economic setup of Romania has long been a postwar thorn in the side of operating companies there. One of the greatest financial hardships which the oil companies—along with other business enterprises — suffer there is providing food for the company-operated canteens. As a rule the practice in itself is beneficial to both employer and employe, but as the companies now are forced to obtain food at high prices—often through the black market—and then sell it to employes at government-pegged prices, which are far under actual cost, the result is a continued loss of capital.

Another complicated procedure which results in financial hardships to oil companies operating in Romania is the Russian methods of payment which are not only puzzling but invariably delayed. The misunderstandings between Romanian and Russian officials over specifications—even after the products have been delivered—is just one of several irritations and hardships which oil officials here report.

While the Romanian Government has ordered frequent wage increases, it is slow to consider company complaints that oil price hikes must follow. Inflation continues at an uneasy pace. On March 6 a government decree was issued—following an appeal by the Association of Romanian Petroleum Industrialists — increasing prices three and a half times their previous level and made the price increase retroactive to January 1, 1946. But even this relief probably will be short-lived.

The accompanying table shows Romanian oil operations from 1938 through 1945.

ROMANIAN OIL STATISTICS
(Thousand metric tons*)

	Crude production	Refinery runs	Domestic consumption	Exports
1938	6,610	6,218	1,674	4,494
1939	6,240	5,837	1,785	4,178
1940	5,810	5,472	1,862	3,493
1941	5,453	5,217	1,811	4,072
1942	5,665	5,260	2,097	3,374
1943	5,273	4,915	2,007	3,159
1944	3,512	3,080	1,108	2,119
1945	4,640	4,764	1,387	3,100

*One metric ton is equal to 7.425 bbl.

American interests in Romania amount to about 12 per cent of the total production and 16 per cent of the refining capacity, held largely by Standard Oil Co. (New Jersey) and Socony-Vacuum Oil Co., Inc. Before the war, 24 refineries were operating in Romania with a combined daily capacity of 224,200 bbl., and a cracking capacity of about 50,000 bbl.

Western Venezuela's Output Up 19.3 Per Cent in 1945

CARACAS. — Western Venezuela crude oil production during 1945 was 218,538,657 bbl., or 19.3 per cent greater than the 1944 production of 183,199,288 bbl., according to reports here. Western Venezuela's 600,000 bbl. of oil a day accounted for 68 per cent of the country's total. This figure had dropped to 60 per cent at the year's end.

Of the total production, some 17,000,000 bbl. of western oil was processed locally, 10,000,000 bbl. was utilized as fuel oil for ships and the balance exported, much of it going through the Panama Canal to Pacific war areas.

Impasse Reported in Mexican Negotiations

MEXICO CITY.—Reports current here indicated efforts to fix compensation to be paid Great Britain and Holland for properties of Mexican Eagle Oil Co., British-Dutch Shell company expropriated by the Mexican Government in 1938, and other oil properties, have reached an impasse. The difference of opinion in evaluation was said to be in the neighborhood of $6,000,000.

Under the agreement of February 7, the three governments had until March 7 to name two appraisers; the following 5-month period was to set the evaluation and the succeeding 5 months to carry on the investigation and present reports to the governments concerned.

Douglas Davidson, commissioner for Anglo-Dutch interests and Enrique Ortiz, Mexican commissioner and director of revenue, were reported on the verge of an agreement whereby both parties would waive all claims against each other, thus clearing the way for an evaluation of the properties. However, within a few days of the time limit, according to reliable sources, a conference between Ortiz and finance minister Eduardo Suarez, brought to light the Mexican Government's claim of $6,000,000 against the Anglo-Dutch interests.

Before negotiation efforts collapsed, settlement appeared headed along the lines of the American settlement whereby Mexico is paying a principal indemnity of some $24,000,000, plus interest, of which $17,000,000 has been paid. The Anglo-Dutch, or Aguila, in-

terests are generally estimated at up to one-half greater in value. The Mexican Eagle properties represented the largest single holding in the Mexican oil industry at the time of expropriation and included wells in the Golden Lane and Ridge areas of the Isthmus, as well as production in the rich Poza Rica field.

Government Company Will Develop Puerto Rico Oil

WASHINGTON.—According to a bulletin received from Puerto Rico, legislation has been approved which amends ancient Spanish mining laws to give the Puerto Rican Industrial Development Co., an agency of the insular government, exclusive rights to development of the island's oil resources.

Preliminary geological surveys have indicated the presence of oil fields lending themselves to possible utilization as an additional fuel supply source for Puerto Rican economy, it was said.

Russians Start Work On Gas Line to Kiev

MOSCOW.—Construction work on the 300-mile natural gas pipe line from Dashava in the western Ukraine to Kiev is now under way. The first compressor station has already been built at Dashava, source of the supply located in the Carpathian foothills. Branch lines are being planned for other industrial centers.

The 500-mile Saratov to Moscow natural gas line is nearing completion. It will transport about 600,000,000 cu. yd. of gas yearly. The six booster stations are equipped with U. S.-constructed Cooper - Bessemer compressors. Another natural gas line, to parallel the present Saratov-Moscow one, may be built later.

Creole's April Output Shows Little Change

NEW YORK.— Creole Petroleum Corp.'s daily average crude production in Venezuela for April showed a 488-bbl. increase over daily average production for March. Runs to stills dropped 6,081 bbl. from March runs to 58,332 bbl. daily.

Daily average production during April was 543,689 bbl., of which 379,718 bbl. came from the Lake Maracaibo area and the remaining 163,971 bbl. from eastern and other areas, including Cumarebo. Daily average production for April 1945, was 441,219, of which 309,019 came from Lake Maracaibo area and 132,200 from eastern and other areas.

Eighteen oil wells were completed in April with no gas wells and only two dry holes. In March, Creole reported completion of 21 oil wells with no gas wells and no dry holes. April's 18 oil wells were brought in in the following fields, with average initial production and average depth shown respectively:

Jusepin, 8, 391 bbl., 4,984 ft.; Bolivar Coastal (B.C.F.), 7, 327 bbl., 4,053 ft.; Mulata, 2, 180 bbl., 5,699 ft.; and San Joaquin, 1, 1,137 bbl., 6,141 ft.

Of April's 52,251-bbl. daily runs to stills, 42,414 bbl. was processed at Caripito and the remaining 9,837 bbl. at La Salina.

Colombian Oil Board Asks Contract Changes

BOGOTA. — Colombia's Oil Advisory Board has suggested a number of undisclosed modifications in the proposed contract whereby D. D. Feldman, independent Texas operator, would refine and market this country's royalty crude, according to Minister of Petroleum Dr. Carlos de Mendoza.

Meanwhile, Compania Unidas de Combustibles and an independent marketing organization known as CUDECOM, are reported to have closed a deal with Tropical Oil Co. transferring title to 54 service stations. Tropical plans to modernize these stations and to train Colombian personnel to operate them. This deal is said to consolidate Tropical's distribution position in Colombia.

Lloyd's Survey Shows 80 Tankers Being Built

LONDON.—A total of 80 tankers are now under construction throughout the world, according to the first 1946 quarterly report of Lloyd's Register of Shipping.

Of this number 49 tankers of 351,472 tons, are being built in Great Britain and Ireland, and five in the United States. The five U. S. tankers are slated for completion this year.

Total American flag tankers of 6,000 gross tons and over, including those owned by the Army and Navy, is now 989, and 40 of these slid off the ways since last October.

Total number of tankers throughout the world, as of September 30, 1945, was 1,806 of which 386 are British; 168 Norwegian; 77 Dutch; 66 Panamanian; and 36 Swedish. Ownership of the remaining 84 tankers is widely scattered.

Tourist Ration Fixed

NICE, France. — The French Government has set 100 gal. as the summer allowance of gasoline for tourists visiting the Riviera. Special cards for food, tobacco, and gasoline purchases will be issued.

International

French Crude Imports Total 1,389,500 Bbl.

PARIS.—Crude imports of France during March totaled 198,500 tons (1,389,500 bbl.) compared with 262,568 tons (1,837,976 bbl.) during the first 2 months of this year.

Imports of petroleum products during March were: gasoline, 97,375 tons (681,625 bbl.); gas oil, 42,320 tons (296,240 bbl.); fuel oil, 50,080 tons (350,560 bbl.); and lubricants, 5,750 tons, 40,250 bbl.

Ethiopian Prospects Good, Sinclair Says in Report

NEW YORK.—Sinclair Oil Corp., which has been conducting exploratory work in Ethiopia, has a "very good chance" of finding oil there, Harry F. Sinclair, president of the company, said at a stockholders' meeting.

At the meeting, Sinclair disclosed the company has a capital expenditure program involving between $90,000,000 and $100,000,000 for expansion and additional facilities which will be spent over the next year or two.

Dutch Find Huge Store of Hidden Japanese Oil

BATAVIA, Java.—Dutch authorities have taken over some 4,000,000 gal. of oil and lubricants which the Japanese unsuccessfully sought to hide at the end of the war.

The stocks were discovered in their hiding places on Sabang, an island off the northwest tip of Sumatra. The Netherlands East Indies petrol board has assumed control of the oil.

N.E.I. Development Awaits End of Political Strife

NEW YORK.—Steps to rehabiliate and develop the Netherlands East Indies properties of N. V. Nederlandsche Pacific Petroleum Maatschappij are now under way and await only the settling of Indonesian political differences in that area. This company is owned by Standard Oil Co. of California and The Texas Co. Just prior to the war oil was found in central Sumatra. The Japanese subsequently brought in a well which is ready for production, and is believed to be an important discovery.

International

Italian Refining Capacity Down to Only 40 Per Cent of Prewar

by Antonio Giordano

MILAN, Italy. — On December 31, 1939, the Italian oil-refining industry could undertake to work 2,180,000 tons of crude oil yearly, as follows:

	Tons
A.G.I.P., Venice	600,000
R.O.M.S.A., Fiume	120,000
A.G.I.P., Vado Ligure (Savona)	20,000
A.N.I.C., Leghorn and Bari	370,000
Socony-Vacuum, Naples	250,000
Societa Italo Americana Pel Petrolio (S.O.N.J.), Trieste	130,000
Soc. Petrolifera Italiana, Fornovo Taro	50,000
Royal Dutch Shell, La Spezia	300,000
Aquila Oil Refining Co., Trieste	350,000
Petroli d'Italia, Fiorenzuola d'Arda	20,000
Miscellaneous	50,000

All the oil refineries in Italy, which before the war were together capable of supplying more than three-quarters of the nation's requirements, have, with the exception of the plant situated at Bari, been almost completely destroyed, reports indicate.

Further, it is not thought likely that any repairs to damaged facilities will be carried out though the importance of restoring storage tanks has been given considerable attention.

The capacity of refineries in prewar years was estimated at almost 3 million tons of petroleum. Now such capacity has been reduced to only 40 per cent of the 1939 figures owing to the heavy damage to the refining plants by bombing during the air raids, and it may be added that the Fiume refinery of R.O.M.S.A. and the Leghorn plant of A.N.I.C. have been practically entirely destroyed while the Trieste, Venice, Naples, and La Spezia plants have been damaged and their output capacity has been reduced. The refinery at Fornovo was completely destroyed except for boilers. The boilers are now being used to distill a small quantity of crude oil north of Fornovo. Soc. Petrolifera Italiana plans to rebuild the refinery as soon as materials are available.

In order to appreciate the above information it is interesting to examine the following data regarding the various plants for the output of benzine, in addition to the normal distillation plants:

1. Thermal cracking:

(a) Dubbs: Two units in the La Spezia plant of Royal Dutch, two units in the Naples plant of Socony-Vacuum, and two units, one of which is the latest type, in the Venice plant of A.G.I.P.

(b) Holmes-Manley: One unit in the Fiume plant of R.O.M.S.A.

(c) Thermal cracking to produce essentially petroleum coke: one unit in the A.N.I.C. Leghorn plant.

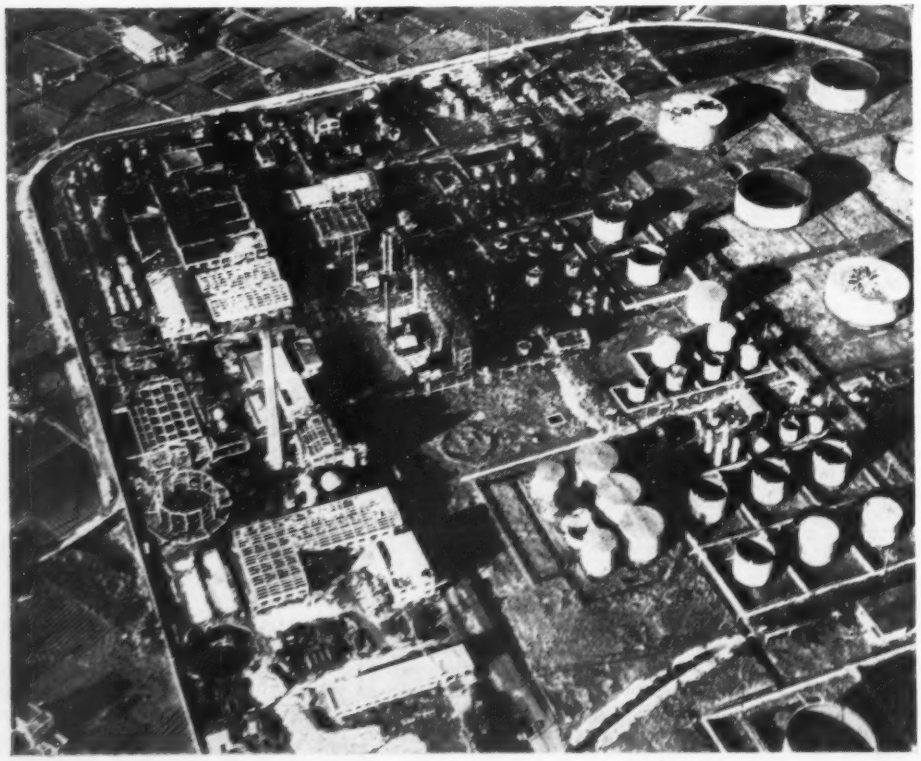
(d) Thermal cracking to produce essentially fuel oil and medium oil: two units in the Bari A.N.I.C. plant, and two units in the Leghorn A.N.I.C. plant.

2. Houdry catalytic cracking system: one unit in the Socony-Vacuum plant at Naples.

3. Hydrogenation system: one F. L. unit and three F. V. units, both in the Leghorn plant of A.N.I.C., and in the Bari plant of the same company.

4. 100 Octane benzine production plant: one alkylation unit in the A.N.I.C. plant at Leghorn.

As can be seen, the latest plants were all located in the Fiume and Leghorn refineries which have been destroyed, and this fact complicates the question of the resumption of the activity of the Italian refining indus-



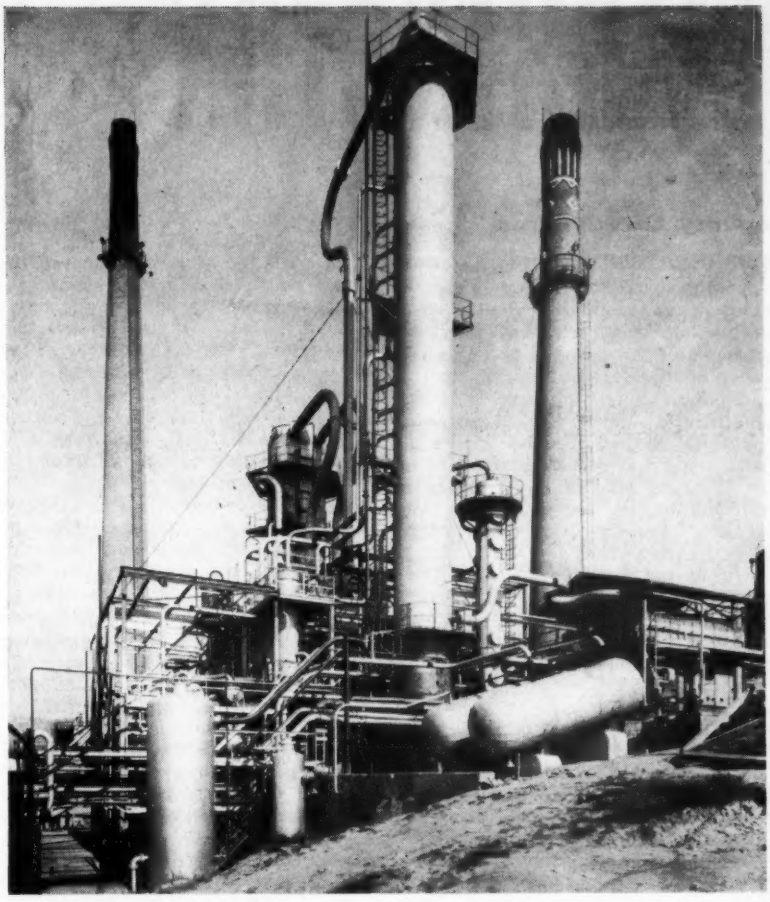
A view of Raffineria de Napoli after its destruction by German demolition squads. (Photograph courtesy Socony-Vacuum Oil Co., Inc.)

try with the object of covering the benzine demand of the Italian market.

As a matter of fact, such question has been the purpose of a discussion in the report of the board of directors to the general meeting of the shareholders of A.N.I.C. (Azienda Nazionale Idrogeneazione Combustibili) regarding the 1944 activity of the concern. The chairman of the concern has pointed out that though there is no doubt that the Leghorn and Bari plants have been built following the autocratic policy of the Fascisti Government to produce benzine through the hydrogenation of lignite, as a matter of fact actually such program has never been put into effect since the two plants have been used to refine Albanian crude oil into benzine and other products the output of which has been larger with the hydrogenation process than with the ordinary distillation process. Since there is reason to believe, he added, that in consequence of monetary difficulties the Italian Government will be forced to limit the purchases of crude oil abroad, it is evident that efforts will have to be made to obtain from the quantities of crude available the largest output of refined products and from this point of view the exploitation of the Bari plant will be of considerable value to the Italian oil industry which, concluded Commendatore Salomone, had many of its most important units destroyed during the war.

In Italian business quarters it is stated that A.N.I.C. is considering the possibility of rescuing some of the machinery from the destroyed Leghorn plants, and particularly the hydrogenation units, and to fit them into the Bari refinery. In such a way the output capacity of the Italian hydrogenation plants would remain unaltered, a fact which is judged here of considerable importance, taking into consideration the present reduced output of the Italian refineries.

The importance of the hydrogenation output, it is stated, assumes considerable importance in regard to the refining of Italian oil which has a high percentage of sulfur. It is added that in the Piacenza district wells have been drilled with rotary machinery which permit drilling to 2,000 meters (6,500+ ft.) from which it is possible to attain a daily output of 3,000 bbl. According to the advice of Italian geologists who have explored the site there is reason to believe that if the Italian State Oil Department could secure machinery to drill up to 3,000 or 4,000 meters of depth it would be possible to bring in other wells in the area giving even a larger output.



View showing detail of the distillation section of the Aquila refinery at Trieste, Italy. (Photograph courtesy Foster-Wheeler Corp.)

VENICE DISTRICT (50 Mines)

Resources announced by the producers		1,600,000 cu. m.
Consumption for the use of mines	89,000 cu. m.	
Losses announced by the mines	212,000 cu. m.	
Difference in the measurements of the producers and those by the Methane State Organization	82,000 cu. m.	
Losses of the methane pipe line	198,000 cu. m.	581,000 cu. m.
Net output (yearly)		1,079,000 cu. m.

PARMA DISTRICT (34 Mines)

Approximate output		2,000,000 cu. m.
Consumption of the mines	120,000 cu. m.	
Household consumption (Salsomaggiore)	250,000 cu. m.	
Losses of the methane pipe line	30,000 cu. m.	400,000 cu. m.
Net output (yearly)		1,600,000 cu. m.

In connection with the Italian search for oil and gas, the Italian methane gas resources and output assume considerable interest, the development of which is distributed as follows around Northern Italy:

The output of methane in Lombardy and in Piedmont is about 250,000 cu. m. (8,830,000 cu. ft.) yearly. The Parma district mines are connected to the town of Milano with a methane pipe line through which the gas is supplied to the public transportation services of the town. Also here it is claimed that the small net output especially in the Venice district is due to the inefficiency of machinery and equipment at the disposal of the Methane Gas State Organization, and it is interesting to note that a project has been worked out for the connection of the Venice district mines with a methane gas pipe line to the port of Chioggia, the leading Italian fishing port in the Adriatic, in order to use methane gas for the operation of fishing boats and to the ports of the Po River in order to allow inland waterway transport with barges equipped with methane-gas-driven engines.

WASHINGTON WATCHING

BY HENRY D. RALPH

Agency Coordination

WASHINGTON. — There is considerable loose thinking in some oil quarters regarding the extent of "coordination" of government activities expected of the new Oil and Gas Division of the Interior Department.

A popular guessing game is to list all federal departments, bureaus, commissions, and agencies which affect the oil and gas industries and to try to figure out how much they will be "coordinated." Actually, this is a bit silly, because just about every federal agency, from the White House down to the Bureau of Home Economics, impinges on the oil industry to a certain extent now and then, and no one who understands the operation of the Government has any expectation that the OGD will try to meddle in all of them.

The new division will be doing well if it can actually coordinate the oil and gas activities of the various other bureaus of its own department and exert a certain degree of influence on the policies of other agencies which have occasional oil problems or which deal with oil and gas regularly.

Soon after his appointment as deputy petroleum coordinator for national defense, Ralph K. Davies told a congressional committee that he was surprised to learn that he had the job of coordinating the oil activities of about 30 federal agencies. He referred to the agencies to which the Bureau of the Budget had circulated the president's letter creating OPC. The majority of these were temporary wartime agencies, and many of these have since been dissolved completely or absorbed into old-line departments. Those were the days when such forgotten agencies as the Office of Facts and Figures, the Coordinator of Information, the National Resources Planning Board, and OPACS were issuing conflicting statements about the gasoline and rubber shortages and what should be done about it.

Enforcement Machinery

When the OGD gets to functioning it doubtless will be called on for advice and assistance by remaining temporary agencies whenever special oil problems arise. These agencies might include the Office of War Mobilization and Reconversion, War Assets Administration, Office of Price Administration, Civilian Production Administration, Office of Defense Transportation, Solid Fuels Administration, UNRRA, and War Shipping Administration.

As a matter of routine operations, actual coordination can be enforced only as regards the oil and gas activities of the brother bureaus who get their orders from the secretary of the interior, the Bureau of Mines, Geological Survey, Bureau of Indian Affairs, and the General Land Office (scheduled to become the Bureau of Land Management). Each of these bureaus will continue to do its own work (unless Secretary Krug does some major reorganizing) but the OGD will help them map out programs and keep their policies from getting crosswise with each other.

Outside the Interior Department, OGD's activities will vary. It probably will throw considerable weight, in the form of technical advice, in such matters as procurement and specifications of petroleum products by the Army and Navy and the Procurement Division of the Treasury (which buys for civilian government agencies). By persuasion it may be able to engineer an agreement for better reporting on foreign oil activities, now split between State, Commerce, and the Bureau of Mines. It might get the Bureau of Mines and the Census Bureau to coordinate statistics about the industry.

Advisory Groups

On the other hand, there are a number of independent commissions which OGD won't be able to influence very much unless these agencies themselves ask for advice. These include the Federal Trade, Interstate Commerce, Securities and Exchange, Tariff and Maritime Commissions. Such agencies as the Patent Office and the National Labor Relations Board probably will never become aware of the existence of OGD, even though they do often affect the oil industry.

A special problem is the Federal Power Commission, which has statutory responsibilities in natural-gas transmission. Unless the president or Congress directs otherwise, FPC can tell OGD to go hang, but by judicious missionary work OGD could eliminate duplicate statistical work and perhaps overlapping regulatory activities, and might even influence policy to some extent.

The Navy may listen politely to OGD advice on handling the Naval petroleum reserves, but the "coordination" may go no farther than that. Likewise the Bureau of Internal Revenue won't consult OGD on audits of the oil company income tax returns, but OGD may be able to persuade it that the intangible drilling and depletion allowances are necessary industry practices and not just loopholes for tax evasion.

The entire list of federal agencies might be analyzed this way, and the conclusion must be that except where emergency problems arise the extent of OGD coordination will be to make suggestions and furnish expert advice. A broad exercise of the president's powers to reorganize the Government could change the picture somewhat, but nobody anticipates that OGD will have any real say in the operations of an agency which affects many other industries as much as it does the oil and gas industries.

Tetraethyl Lead Order

CIVILIAN Production Administration was putting finishing touches on its June tetraethyl lead order this week, which was expected to allocate about 4,100 tons of metallic lead for Ethyl fluid manufacture during the month. May allocation was 3,800 tons. It will also permit refiners to carry over into June any unused ethyl fluid left from their May allocations.

As defined, the order reduces the ceiling on premium leaded gasoline from 80 to 78.5 octane and provides that only 22 per cent of the fluid used during the base period may be used in premium gasoline during June. On housebrand gasoline the order continues the limit of 27 per cent of the amount used during the base period of November-December-January.

The over-all lead situation is not improving, and the Office of War Mobilization is planning another inter-agency conference to see if any progress has been made toward a coordinated program to increase production.

Public-Land Leasing

PRESIDENT TRUMAN has directed that the Interior Department take charge of oil and gas leasing on national forest and other lands administered by the Department of Agriculture, but it is not yet determined whether they will come under the general leasing act. The industry has long protested Agriculture's leasing regulations, which require bonuses

for oil leases and in other ways differ from Interior's system.

Congress has 60 days to stop the transfer under the governmental reorganization act. Interior attorneys are studying the leasing laws to determine whether the forest lands must continue to be leased under Agriculture's regulations or administered like the rest of the public domain, but no decision will be reached before the transfer of jurisdiction becomes final. Meanwhile Congress might take positive action to settle the question since the pending Hatch-O'Mahoney bill to revise the general leasing act would put forest lands under that act.

The President's order does not give Interior the leasing of all government-owned lands, but it does cover those most important for oil and gas development.

Navy Report Shows Loss On Elk Hills Investment

WASHINGTON.—The Navy Department reported to Congress last week it lost $505,937 on a $13,000,000 investment in the Elk Hills, California petroleum reserve which it developed jointly with Standard Oil Co. of California.

Com. W. G. Greenman, director of naval petroleum reserves, in a report to the House naval appropriations subcommittee, said operations would have shown a profit of $5,000,000 had they continued to the end of 1947 as authorized by Congress. The Navy discontinued withdrawing oil from the reserve for its own account at the end of the war last August.

Meanwhile, in Los Angeles, it was learned the Navy Department, to conserve the reserves, has reduced production from the field from approximately 15,000 bbl. daily to 7,980 bbl. daily plus any oil produced in testing future completions in the Stevens sand. Field production is not expected to exceed 10,000 bbl. daily under the arrangement.

The 7,980-bbl. allowable is restricted to production from the Scalez, or upper zones. The Navy Department and Standard of California have completed the Navy's 44-24-Z in the Stevens sand but have shut in the well without making a production test at this time.

Gunn Made Director of A.P.I.'s Refining Division

NEW YORK.—William T. Gunn, has been named director of American Petroleum Institute's Refining Division, succeeding Dr. R. P. Anderson who retired December 31, 1944.

The new director is a Texan. He was born at Biardstown, February 24. 1904, and attended Texas A. & M. College and the North Texas State

W. T. GUNN

Teachers College before graduation from the University of Texas in 1926.

After teaching high school chemistry at Austin for a year, Gunn worked for The Texas Co. at Port Arthur. He commenced in December 1928, and worked there until joining the Institute. He was chemist in Texaco's research laboratory at Port Arthur, chief chemist at both the Houston and Casper Works; and came to New York in 1943 as assistant to K. G. Mackenzie.

In New York, Gunn's work has consisted chiefly in research development and plant operation. He participated in the work of the technical advisory committee of the Petroleum Industry War Council.

Reservation Plan Set Up For Chicago A.P.I. Meeting

NEW YORK.—How to make reservations for the twenty-sixth annual meeting of the American Petroleum Institute at Chicago November 11-14, 1946, was explained in an announcement last week by William R. Boyd, Jr., A.P.I. president.

A number of Chicago's larger hotels, including the Stevens, headquarters for the meeting, will make reservations only through the A.P.I. housing committee, consisting of L. S. Wescoat, Sheldon Clark, B. L. Majewski, and A. W. Peake. Hotels included in the plan are the Stevens, Atlantic, Bismark, Brevoort, Chicagoan, Continental, Harrison, LaSalle, Palmer House, and Planters. Those who wish to arrange accomodations at hotels other than the above should do so directly with the hotel and not through the committee, Boyd said. Requests for reservations should be made as soon as possible but not later than July 15.

Group reservations should be made by letter to the committee giving names of individuals for whom reservations are being made; dates of arrival and departure; type of accomodation desired, and whether or not reservations may be made at other than the Stevens Hotel. Address of the committee is: A.P.I. Housing Committee, Chicago Convention Bureau, Inc., 33 North LaSalle Street, Chicago 2.

U. S. Gasoline, Oil Tax Yields Decline in March

WASHINGTON. — Receipts from the federal Government's tax levies on gasoline and lubricating oil showed a sharp drop during March.

The gasoline total was 29 per cent under the corresponding month of 1945 and the lowest for any month since July 1944. Receipts during March were $24,743,590, against $32,423,441 in February and $34,898,193 in March 1945.

The tax from lubricating oil netted the Government $4,863,612 in March. Collections in February from this source were $5,567,161 and in March 1945, $9,901,856.

In contrast to the reduced gasoline and lubricating oil tax yields, levies on sale of automobiles and trucks showed increased return in March. Pipe line transportation tax collections in March amounted to $1,190,902 against $979,122 in February and $1,444,661 in March 1945. Receipts from taxes on the sales of automobiles and motorcycles totaled $3,205,587, against $424,320 in February and $259,117 in March 1945. The tax on trucks yielded $3,531,187. Return in February was $3,452,509 and in March 1945, $1,603,287.

Gasoline tax yields in Texas soared to an all-time peak in April. George H. Sheppard, state comptroller, reported collections during the month totaled $6,002,353, compared to $5,253,438 reported by Texas distributors in March and $4,152,479 in April 1945. The largest prewar collections ranged between $5,000,000 and $6,000,000 a month.

Army-Navy Oil Board Plans Conference

WASHINGTON.—The Army-Navy Petroleum Board, through Col. O. F. Kotick, chief of plans and programming, and Col. G. H. Vogel, executive officer, said that 100 officers and former reserve officers who had returned to the petroleum industry would be invited to attend a conference here June 13-14 to discuss problems of the industry. Discussions will include subjects under which the various divisions of the board operate: plans, supply, technical, storage, distribution, and transportation.

Two Promising Tests Revive Interest in Florida Wildcatting

by Herndon David

INTEREST in Florida, youngest of the oil-producing states, has been considerably increased recently due to report of oil saturation in a Monroe County deep wildcat and oil shows in a test being drilled in Hernando County.

The former well, O. D. Robinson 1 State, is being drilled on Barnes Sound by the M. L. Benedum interests, and to date has found an overall oil section of more than 200 ft., according to official reports. Oil shows were first encountered at 10,162 ft. in the Lower Cretaceous. Operators immediately resorted to continuous coring, and oil-bearing horizons were recovered intermittently to a depth of 10,365 ft. Many of the cores were "bleeding cores" and some free oil was reported in the core barrel.

The best saturation and best chance of production are believed to be in the top 100 ft. of the oil-bearing horizons, but no tests as yet have been made of this section. The bottom 100 ft. was composed of tight limestones, and a 1-hour drill-stem test of this section was made with packer set at 10,284 ft. using ¼-in. top and ⅝-in. bottom chokes. Recovery was the 3,640-ft. water cushion, 170 ft. of drilling mud, and 40 ft. of heavy salty mud with no shows of oil or gas. Bottom-hole pressure was recorded at 1,500 lb.

Next an attempt was made to force acid into this lower section, but the packer collapsed and the acid was lost before reaching the proper formations. Following this failure, operators decided to drill ahead in search of other saturated zones.

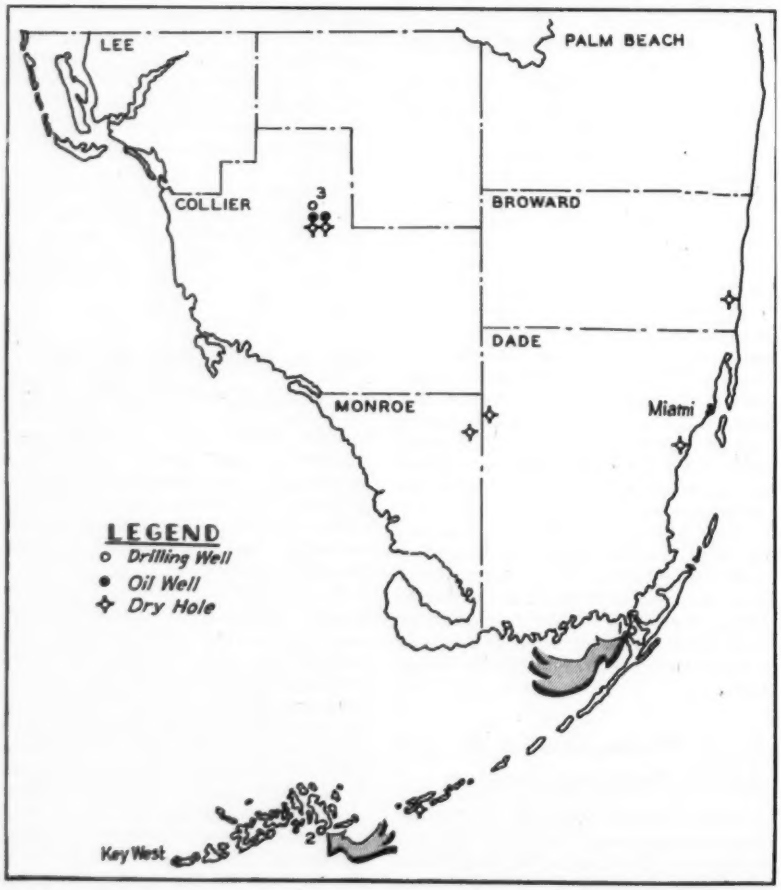
After drilling to a total depth of 12,050 ft. without finding additional shows, operators plugged back and perforated casing opposite the lower zone from 10,337-63 ft. with 130 shots. A drill-stem test following this operation showed only 60 ft. of drilling fluid in 5 hours, and the well was acidized with 2,000 gal. A swab test showed a small amount of heavy black oil before packer gave way. An additional 10,000 gal. of acid were then injected and resulted in a slight increase in the recovery of the heavy oil, but the commercial significance was still slight. Preparations are now being made to perforate opposite the upper saturated zone for further tests.

The Robinson 1 State is approximately in N½ N½ NW 29-59s-40e, Monroe County. Actual location is offshore in Barnes Sound, between the mainland and Key Largo, at a point about 25 miles south of Miami. It is in the northeast corner of the Blanchard Concession which originally comprised nearly 7,000,000 acres of state-owned lands on and near the southern tip of the Florida Peninsula. The portion of the concession on which the present well is being drilled was transferred to the M. L. Benedum interests.

The nearest dry holes to the Robinson well are the Peninsula Oil and Refining Co. 1 Cory, 6-55s-34e, Monroe County, and the Florida East Coast Railroad Co. well at Marathon, Key Vaca. This latter well was on one of the Florida Keys about midway between Key Largo and Key West. The top of the Lower Cretaceous was reported at 8,168 ft. in the 1 Cory, while the Barnes Sound test gave the top of the same formation at 6,997 ft. The Key Vaca well stopped in the Oldsmar limestone of Eocene age, but a hypothetical projection might place the top of the Lower Cretaceous in this well at a depth of about 8,000 ft.

The second and most recent of the Florida wildcats to find indications of oil is the Ohio Oil Co. 1 Hernasco Corp., 19-23s-18e, Hernando County. A show was noted in cuttings while drilling at 5,595-600 ft. in the Cretaceous, topped at 3,340 ft., but cores from 5,600-05 ft. failed to reveal any additional shows. After running an electric log at 5,605 ft., a drill-stem test was taken at 5,585-5,605 ft. which recovered 2,940 ft. of salt water and 60 ft. of mud in 35 minutes. At present the well is drilling ahead below 7,825 ft.

The oil showings in both the Monroe and Hernando County wells as



Map showing two wildcats now under way to test the oil possibilities of the Blanchard Concession, Monroe County, Florida. The O. D. Robinson 1 State, which has shown some possibilities of making a producing well, is shown at 1, the Gulf Refining Co. 1 State at 2, and the Sunniland field at 3. The well shown as drilling in the Sunniland field has now been completed as the largest well in the field to date

well as that produced in the Sunniland field of Monroe County is from beds of Lower Cretaceous age. No indications of oil have been found in other strata anywhere in the state. This is interesting since the Lower Cretaceous is known to be absent in the northern part of the state, while very thick sections are present in the southern part. From this it appears that the Upper Cretaceous beds overlap a thick wedge of Lower Cretaceous sediments, and that at least locally, there must be an important unconformity between the Lower and Upper Cretaceous strata. The 5,000 ft. or more of Lower Cretaceous sediments found at Sunniland, therefore, must wedge out somewhere to the north and updip, and it is possible that large oil fields exist in this region.

For many years, Florida was thought to be devoid of any structures in which oil could accumulate. The principal structural feature of the state is a gentle doming that brings the Ocala limestone (Upper Eocene) about 150 ft. above sea level in the northern part of the peninsula. This uplift extends a little more than halfway down the peninsula, a distance of approximately 250 miles. An angular unconformity at the base of the Ocala limestone is known to exist, which indicates that there could have been more pronounced fording in pre-Ocala formations which would not influence the structure of the more recent sediments above. Structures suitable for accumulation of oil in commercial quantities, therefore, could conceivably be present in pre-Ocala strata throughout the state.

Records Lacking on Earlier Wells

To date only about 125 wells have been drilled in Florida. Many of the earlier companies that drilled these wells were promotional enterprises and the wells were drilled to encourage the sale of stock, with no geology and no records kept, a fact that perhaps discouraged scientific oil search in the state for many years. The majority of the wells were also shallow, and until Peninsula Oil & Refining Co. drilled its deep test to 10,006 ft. in 1939, no well penetrated formations below 6,000 ft., and very few were drilled below 3,000 ft. When the major companies began to show interest in oil possibilities of Florida in the late thirties, however, depth began to be considered seriously, and the first deep test drilled by one of these companies resulted in the discovery of the Sunniland field.

This field, a Collier County discovery of Humble Oil & Refining Co. in 1943, contains the only three oil wells ever drilled in Florida. Production from the first two wells completed totals about 90 bbl. of oil and a large volume of water daily while the third, a very recent completion, had an initial production of 288 bbl. daily with no water. This third well has not yet shown the rapid decline characteristics of the first two wells, although it has not been on production long enough to draw definite conclusions, the well has considerably improved the outlook for the field.

The oil produced at Sunniland is from Lower Cretaceous limestone beds, which have been correlated with the Glen Rose of Texas, and is found at a depth between 11,500 ft. and 12,000 ft. It is black and has a gravity of about 20°-25° A.P.I., very similar to that found in the Robinson well. Despite the fact that the amount of oil produced has so far been rather insignificant, it has answered the question of whether or not source beds exist in Florida with a definite "yes," and has been responsible for the intensive prospecting and exploration campaign which has followed its discovery.

In addition to the two wildcat wells already mentioned, six other tests are now under way in Florida. One of these, the Gulf Refining Co. 1 State, is also on the Blanchard Concession but located about 80 miles southwest of the Barnes Sound well. The Gulf test is in the southeast corner of the concession on Big Pine Key, 2½ miles off the famous Overseas Highway No. 1. It is in 2-67s-29e, Monroe County, the most southerly location of any well ever drilled in the United States, and is now drilling below 7,640 ft. Formation penetrated, based on samples, are the Pliocene at 50 ft., Miocene 200 ft., Tampa 707 ft., Oligocene 834 ft., Suwanee 1,190 ft., and Claiborne 1,310 ft.

Stripper Group Organizes Drive For Maintenance of Subsidy

THE executive committee of the National Stripper Well Association meeting in Tulsa last week set up an eight-man planning committee to organize its drive for maintenance of the federal payment to marginal oil producers.

The 30 members of the executive committee during their 2-day session in Tulsa called for "immediate action" to provide a permanent price differential for the small producer. Federal officials in Washington have indicated a possibility the payments may be dropped with removal of price control from the oil industry. Appropriations for the payment expire June 30. Payments range from 6 cents a barrel for the so-called hardship cases to a flat 75 cents per barrel for Pennsylvania grade wells. The average payment is from 20 to 35 cents a barrel.

Members of the planning subcommittee are J. Howard Marshall, Ashland, Ky., chairman; Howard Whitehill, Tulsa; Carl Weidman, Owensboro, Ky.; Edwin Hayes, Independence, Kans.; W. J. Brundred, Oil City, Pa.; Fred Sehmann, Wichita Falls, Tex.; J. N. Thelan, Great Falls, Mont.; and E. C. Arnold, Pawhuska, Okla.

Arnold is one of the organizers of the National Oil Conservation Committee which has been carrying on a campaign for endorsement of the conservation payment by various organizations and civic groups in Oklahoma and Kansas.

Case to OPA

The association's executive committee voted to present their case to federal officials in Washington. A resolution calling for continuing the payments will be worded by H. M. McClure, Alma, Mich., and Sehmann and laid before officials of the OPA and other federal agencies. The next meeting of the association will be held in connection with the Independent Petroleum Association meeting in Fort Worth in October.

The association is basing its appeal for continuation of the payment principally on the conservation issue. A statement issued after the Tulsa meeting said the members of the executive committee "expressed themselves as unanimous on the need for a general crude oil price increase but were agreed that such an increase would be inadequate to the need of the stripper well operators."

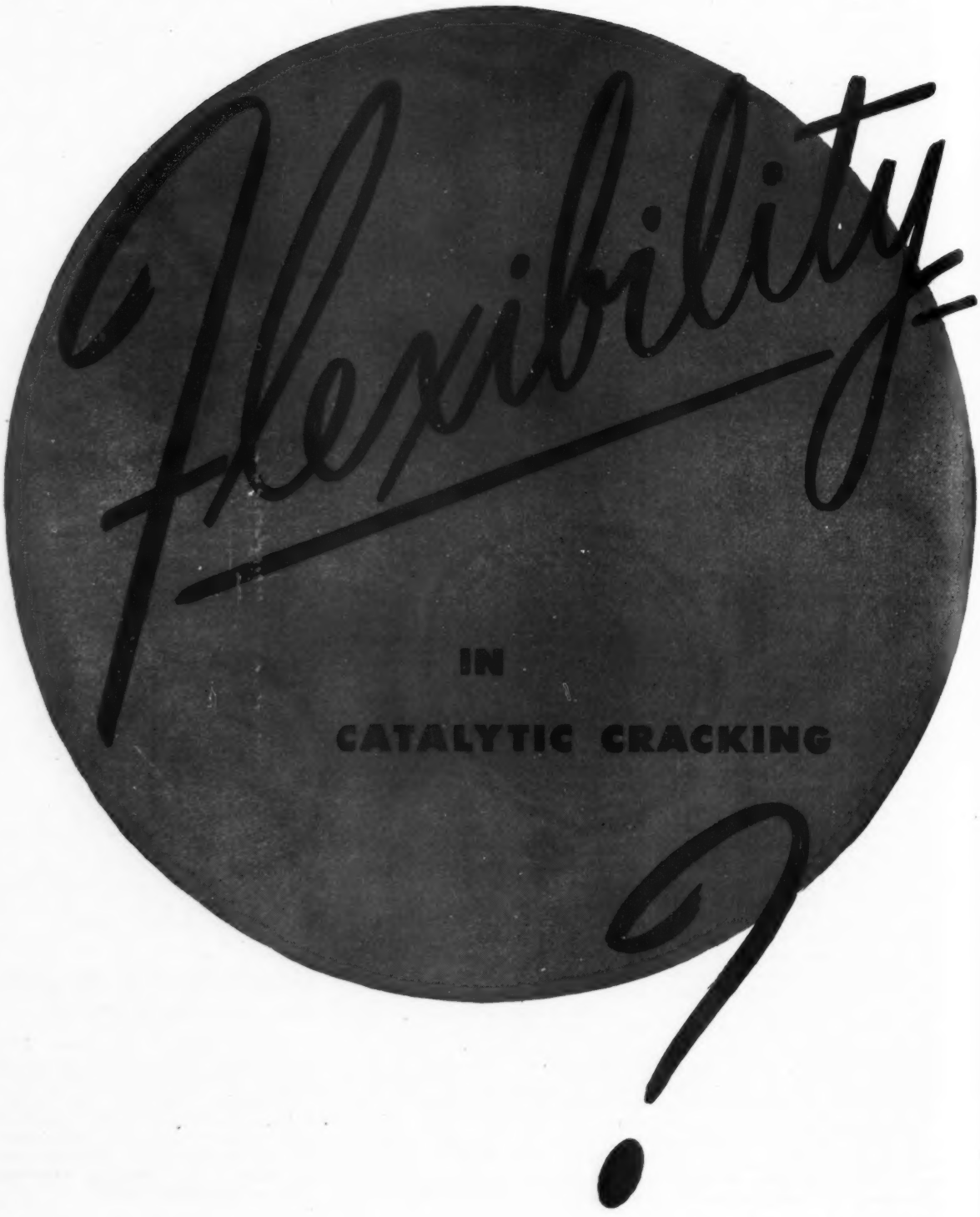
"The problem," the statement continued, "is not alone that of the oil man . . . crude reserves underlying stripper properties are vital to the nation's security and to the economic welfare of many communities and states, and the prodctivity of these reserves must be maintained."

Government Sells Oil Land Back to Original Owners

WASHINGTON.—War Assets Administration last week announced the return of titles of three tracts of land near Norman, Okla., to the original owners. The property, declared surplus by the Navy, was originally purchased for $45,716 but was sold back for $47,216, the difference covering costs of buildings erected.

Question:

WHAT IS



Gasoline Market Continues Firm After Third Recent Advance

WITH demand generally at or near wartime levels, the market in gasoline continued firm early this week, even after another ⅛-cent rise in quotations in the Mid-Continent area.

The latest advance was the third ⅛-cent rise in recent weeks when gasoline turned upward after its late winter slump. Regular was listed at 5⅝ cents on the Group 3 basis, although some supplies were available ⅛ cent below this figure.

In natural gasoline, there were increasing indications of another upturn in the price of this product, now quoted at 2½ cents in North Texas and 3 cents in Oklahoma. The somewhat unseasonal rise in natural gasoline was occasioned by brisk gasoline trade.

Petroleum markets were featured by renewed interest in kerosene. One market observer said refiners seem to feel that by holding supplies through June and early July, they will be able to sell all available at better prices. From New York came a report that No. 2 burning oil and kerosene are tight in that area, although stocks are not falling off. Inquiries were firming the market for both products.

The threat of another prolonged coal production tieup added to the demand for residual and other heavy products. These commodities have been in short supply for months. Market sources believe, however, greater demand for oil to replace coal will be balanced by the slackening of industrial activity generally.

The oil transportation situation had returned to normalcy this week after the brief rail strike. Selling operations of tank-car marketers and refiners were at a standstill last week during the rail walkout. The government-forced settlement ended preparations in the oil industry to meet the rail emergency, including maximum pipe line use and trucking of supplies.

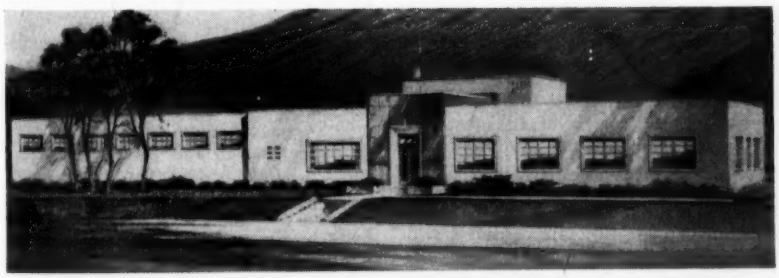
Daily gasoline demand for the week ending May 18 was up 145,000 bbl. at a reported total of 2,187,000 bbl. This compared with the wartime demand of 2,221,000 bbl. in the corresponding 1945 week. Demand for all principal refined projects during the May 18 week was estimated at 4,175,000 bbl., a decline of 23,000 bbl. from the preceding week.

In California, consumption of gasoline and other products was soaring to record levels. Demand on the West Coast has been high for months due to an influx of population in the area as well as to reasons common to the remainder of the country, including heavy traveling in the first postwar summer.

Farm demand for gasoline and tractor fuel was picking up throughout the Midwest after a slight slackening in the last 2 weeks, according to market sources. On the Gulf Coast, regular was reported at the ceiling of 5¾ cents, while premium grade was off slightly at 6⅜ cents.

A.P.I. Meeting Postponed

FORT WORTH. — The midyear meeting of the board of directors of the American Petroleum Institute, scheduled here early this week, has been indefinitely postponed because of the railroad strike.



The new Standard Oil Co. of California production-technology laboratory to be built adjacent to Murphy-Coyote field, four miles northwest of Fullerton, Calif., is shown here. Construction of the $220,000 building is expected to begin in June. The laboratories will be used for a study of drilling methods and problems related to more efficient recovery of crude oil in established fields

Army's Plywood Barge Described in Report

WASHINGTON. — A sectionalized plywood barge, designed for the Army during the war, proved satisfactory for transporting petroleum products in rivers, harbors, or along coastal shore lines, according to a report released today by the publication board, Department of Commerce.

One of the advantages of the barge was that its sections could be used as storage tanks on land or placed on a heavy trailer and towed. The barge consisted of nine center sections and six rake end sections, lined with a synthetic rubber compound, for holding gasoline.

Louisiana Allowable Up

BATON ROUGE, La.—June allowable for Louisiana has been set at 417,864 bbl. daily by the Oil Conservation Board. The gain of 10,639 bbl. over the May allowable was due to new wells completed during the month. Per-well allowable remained unchanged.

DEATHS

Shirl H. Ward, 72, died May 20 at Bradford, Pa. Ward was engaged in the drilling contracting business in Pennsylvania and in foreign fields.

Earl E. Lewis, 61, a native of Butler County, Pennsylvania, and active in the oil and supply business since 1908, died May 19 at Bridgeport, Ill.

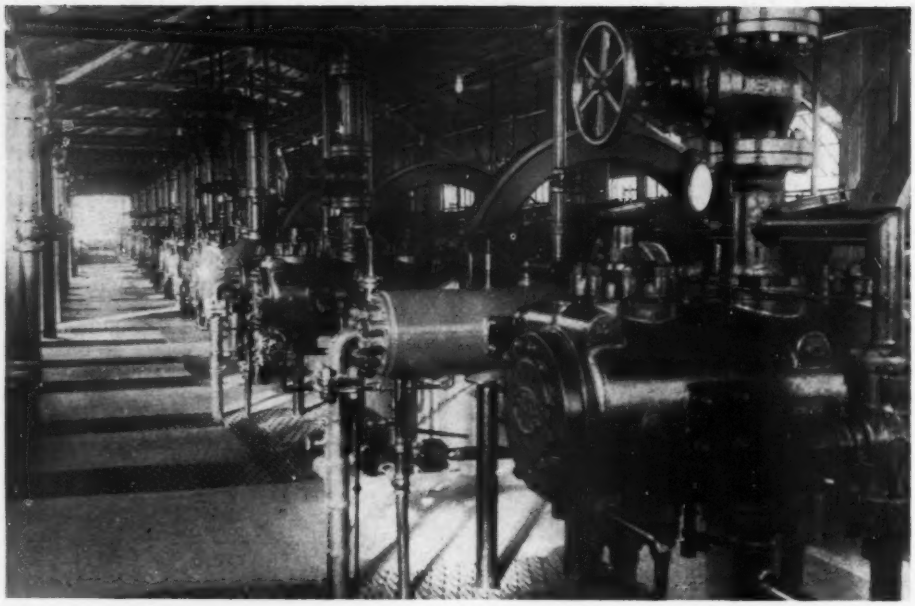
Vernon A. Sparks, 55, superintendent since 1923 of marine operations for Standard Oil Co. of New Jersey, died May 18 at White Plains, N. Y.

T. T. Blakely, 73, pioneer Oklahoma oil operator who opened the Blakely pool in Okfuskee County, Okla., in 1932 and a second pool bearing his name the following year, died May 21 in Oklahoma City.

Charles R. Morgan, 57, night plant foreman for The Texas Co. in Tulsa, died May 22 in Tulsa.

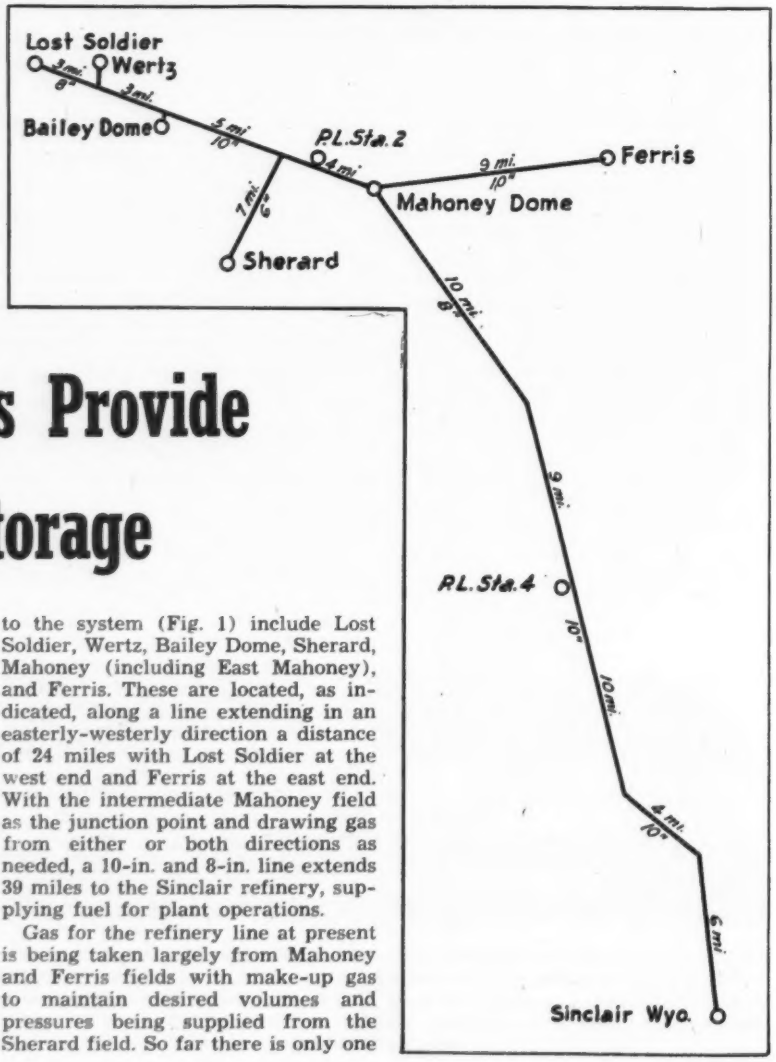
Guy W. Runyan, 48, president of the National Association of Petroleum Retailers, died May 23 in Ames, Iowa.

Joseph A. Chanslor, 78, died May 21 at his home in San Francisco. Chanslor, a pioneer operator in California, produced the first crude from Coalinga field. He was an organizer of Associated Oil Co. and after its merger with Tide Water Associated Oil Co. in 1910 became a director in that company.



Lost Soldier booster station containing ten 170-hp. gas-engine compressors

Below: Main gas system serving Sinclair Wyoming Oil Co.'s field and refinery operations in Baroil (Lost Soldier) district, central Wyoming



Fields operated by Sinclair Wyoming Oil Co. in its Lost Soldier, Wyoming, district are linked by a common gas system designed to insure the most efficient and conservative distribution and utilization of their respective available production.

by Neil Williams

Depleted Sands Provide Floating Gas Storage

GAS requirements for the various fields operated by Sinclair Wyoming Oil Co. in the Baroil (Lost Soldier) district of Carbon and Sweetwater counties, central Wyoming, and for Sinclair Refining Co.'s refinery at Sinclair, Wyo., are served by a common gas system. Operation of this system embraces a number of practices designed to insure the most efficient and conservative distribution possible of the available gas production of the respective fields. Special provision is made for storage in depleted sands of the Lost Soldier field of any gas produced in excess of immediate needs to serve as a reserve to take care of periodic local increased withdrawals from the system.

Fields tied into and supplying gas to the system (Fig. 1) include Lost Soldier, Wertz, Bailey Dome, Sherard, Mahoney (including East Mahoney), and Ferris. These are located, as indicated, along a line extending in an easterly-westerly direction a distance of 24 miles with Lost Soldier at the west end and Ferris at the east end. With the intermediate Mahoney field as the junction point and drawing gas from either or both directions as needed, a 10-in. and 8-in. line extends 39 miles to the Sinclair refinery, supplying fuel for plant operations.

Gas for the refinery line at present is being taken largely from Mahoney and Ferris fields with make-up gas to maintain desired volumes and pressures being supplied from the Sherard field. So far there is only one

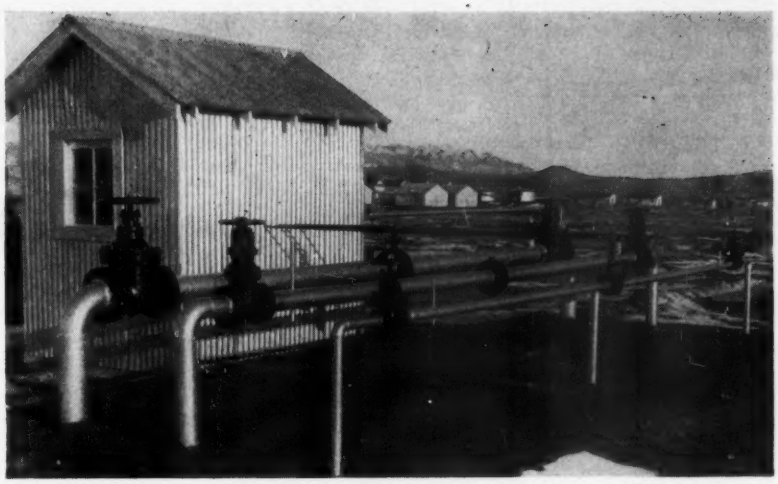
well in the latter field but its capacity is more than ample to take care of any requirements which the Mahoney and Ferris production might not be able to meet. This well, a comparatively recent completion, is tied into the system by 7 miles of 6-in. with junction at a point midway between the Bailey Dome field and Mahoney. To date approximately 254,000,000 cu. ft. of gas has been taken from the well. Present pressure is around 1,120 psi., a drop of less than 180 psi.

A gate block is located in the main line between the Bailey field and the Sherard well junction and at present in normal operation gas from the Bailey, Wertz, and Lost Soldier fields is not being taken eastward to the Mahoney-Sinclair system although it is available for this purpose if needed. Bailey gas is not turned into the main line eastward at any time in warm weather since this gas carries an exceptionally high paraffin content which might be deposited in and clog the line, and thus possibly shut off gas deliveries to the refinery. Atmospheric cooling of the gas is depended upon between the wells and the line, and in warm weather the temperature drop is not sufficient to deposit the paraffin before it gets to the main line. In cold weather there is no particular danger because the gas usually is cooled below the temperature of the line and most of the paraffin is deposited in the flow lines and cooling system where it can be removed.

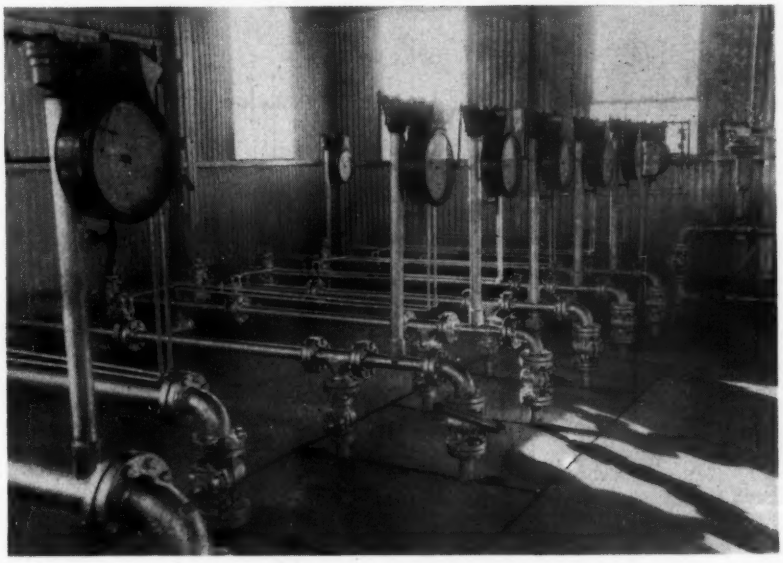
Pressure on the Mahoney end of the system to Sinclair is maintained at 29 to 30 psi. so far as possible. A greater pressure usually is not advisable since wells in the Mahoney and Ferris fields, which provide the nucleus of the gas, are low-pressure (150 to 160 psi.) wells and make water. With a greater line pressure, the increased back pressure on the wells would tend to cause the water head to build up in the wells, and thus kill the wells. At present there are 13 wells in these fields tied into the system, of which 12 are produced. Normally, however, as a conservative measure, not more than five are produced at a time. If more wells are produced at a time, the volume taken from each well must be reduced to a point that it is not sufficient to unload the water, and as in the case of increasing back pressure on the wells, the water head would build up in the bottom of the hole and kill the well. Consequently, when additional gas is needed, it is taken from the Sherard well, or from other fields on the system.

Both Mahoney and Ferris are old gas-producing areas and to date have produced more than 45,375,413,000 cu. ft. of gas. Original pressures were 900 to 920 psi. Present withdrawals are at the rate of approximately 282,000,000 cu. ft. annually.

The Wertz field, located about 5 miles west of the Bailey field, originally was one of the main sources of gas supply for the system. Within the last several years, however, the remaining five gas wells, producing from the Frontier and Sundance sands, have been drawn on primarily to provide supplemental gas for pressure maintenance operations being carried on in the more recently developed deeper Tensleep oil producing sand.* Any excess production still is available for the system, if needed. Production from gas wells in this field has totaled more than 61,320,000,000 cu. ft., of which 28,620,000,000 cu. ft. has been taken from the above five wells and the remainder from wells now abandoned. Present well pressures average approximately 350 psi. as compared with original pressures of around 900 psi.



Header and metering installation at Lost Soldier booster station. Line in left foreground is suction header for supplemental gas from main system



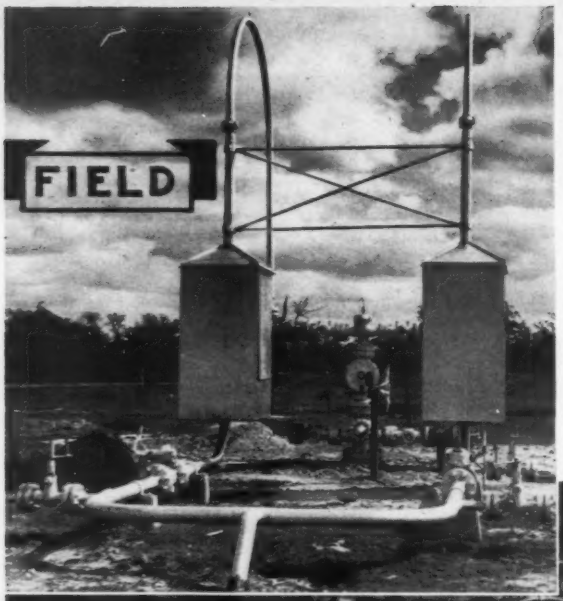
Header and metering installation at central master gate on main gas line entering Lost Soldier field

Current gas recovery in the Lost Soldier field is approximately 1,550,000 cu. ft. daily, consisting of about 750,000 cu. ft. taken off the separators of Tensleep sand oil wells and 800,000 cu. ft. from the bradenheads of the older shallow sand (Wall Creek and Sundance horizons) pumping wells. Since gas requirements in the field at this time substantially exceed the daily production, the additional needed must be obtained from other fields on the main system. At present much of this extra gas, averaging approximately 1,453,000 cu. ft. daily during a recent winter month, is being supplied from the Bailey field.

Field-gas requirements cover the

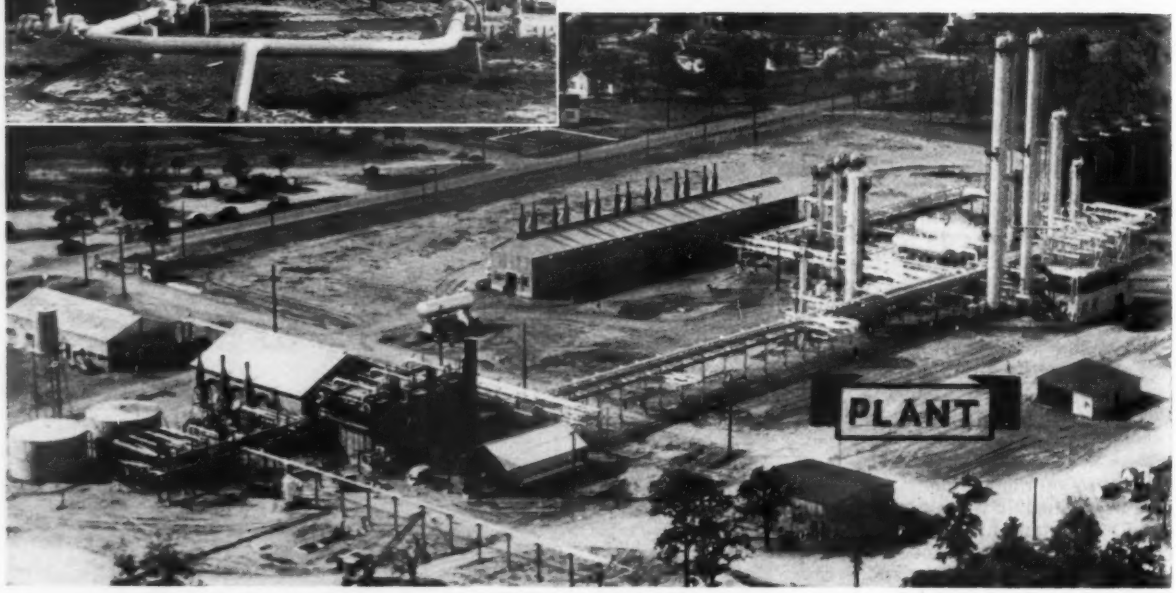
(Continued on page 75)

*Neil Williams, "Pressure Maintenance in Wertz Field Provides Sustained Production," The Oil and Gas Journal, December 16, 1943, p. 60.



New Cycling Plant Produces 300,000

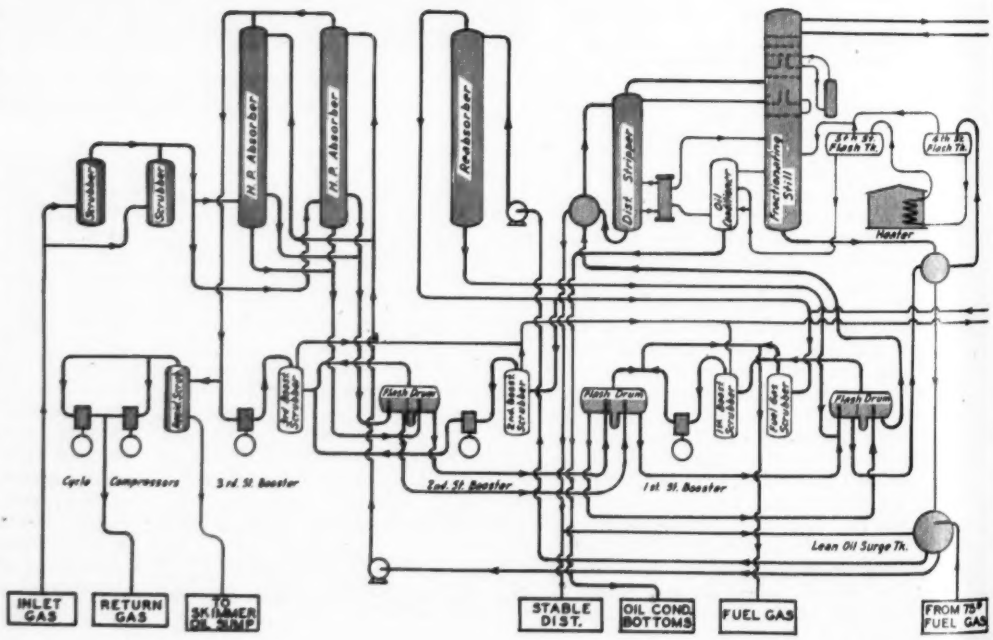
by Arch L.



Top: Sheridan dual-completed producing well showing test connections and housed meters for the flow from each producing zone

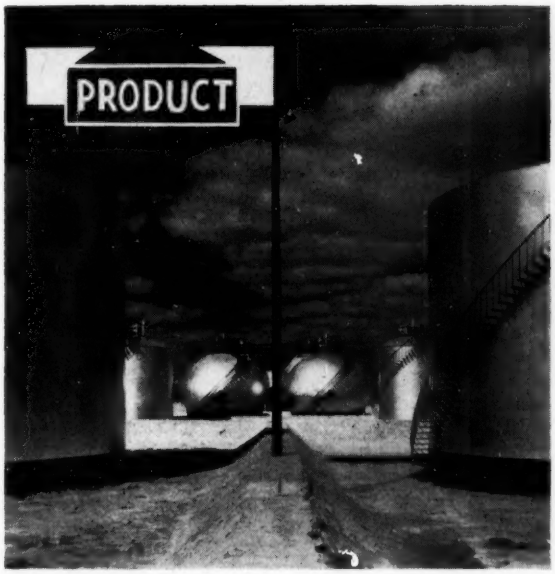
Above: Aerial view of Sheridan plant showing heater and boiler area on left, process area in center, and cooling tower at right. Camp dwellings for staff employes are seen in the distance

Right: Multiple flashing stops characterize the operation of Shell's Sheridan plant, as indicated in this diagram. In the picture on the opposite page are shown the storage tanks, with distillate storage in foreground, isopentane storage in background, and between them, gasoline spheroids



Conserves Gas; Gal. Products Daily

Foster



CONSERVATION of the entire raw products of the Sheridan condensate field, Colorado County, Texas, is the purpose and design of the Shell Oil Co., Inc., plant established there. The location is 80 miles west and 20 miles south of Houston. One of the undesirable features of most large oil and gas fields in the past has been the inevitable use of flares in which to burn excess gas which must be produced, also inevitably, with the oil or distillate. The Shell plant at Sheridan, like other modern plants of this general type, has eliminated waste by recovering all the liquefiable products which is practicable, including propane for liquefied petroleum gas. It conserves the stripped gas and makes it do the work of bringing up more distillate, natural gasoline, and liquefied petroleum gas by recompressing the gas and returning it to the formation as a cycling system of operation.

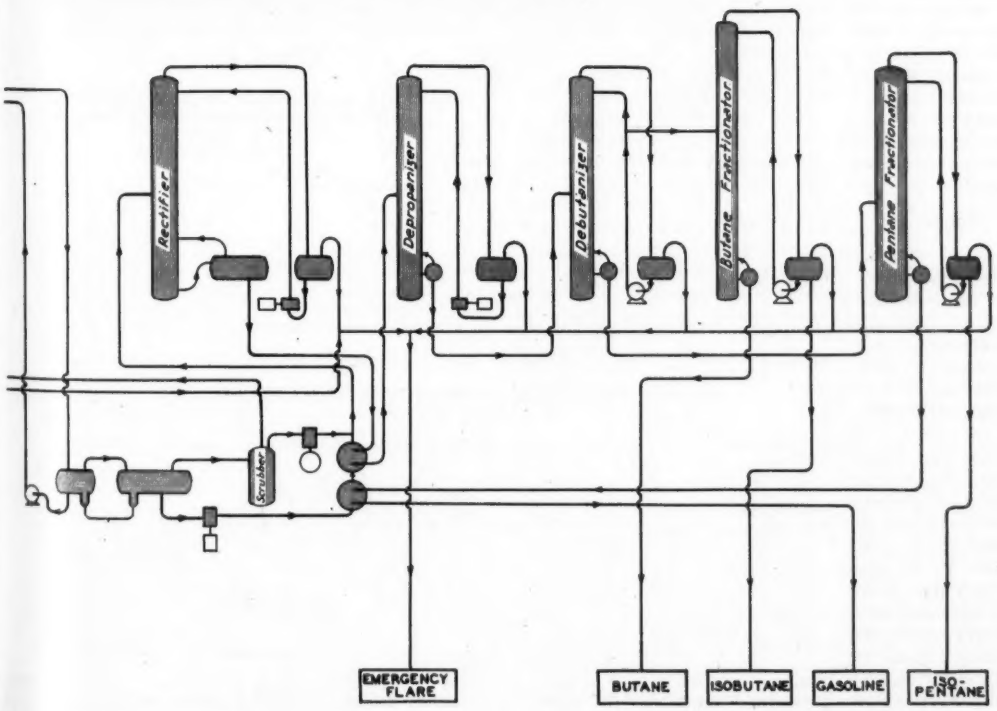
In its design the various products are separated and fractionated to the required commercial standard purity. Stripped gas is returned to five input wells arranged according to a preconceived pattern, under conditions mentioned later herein.

Construction work was started on the plant when T. R. Goebel, head of Shell's natural-gasoline department, broke ground for the first foundations on June 7, 1944. The plant started operations in August 1945; Petroleum Engineering, Inc., built it. It now processes gas from 15 wells, most of which are owned by Shell.

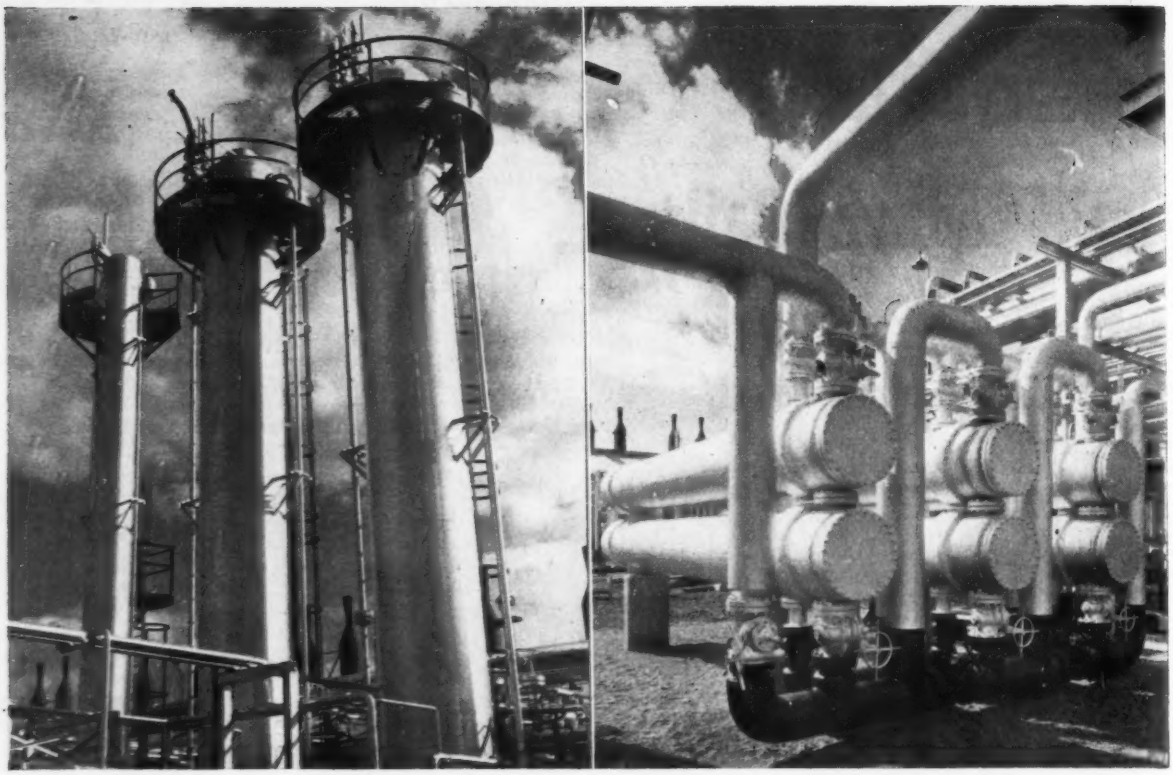
Gas is drawn from two horizons called the "L" and "Q" zones. The L zone is at about 9,300 ft., while the Q zone is 10,300 ft. down. Gas is drawn at approximately the same rate from each zone, a typical day's production showing 54 per cent from the L zone and 46 per cent from the lower stratum. Stripped gas is returned to each zone separately in dually completed wells. Gas to the L zone is carried in the casing annulus while that returned to the Q zone passes through the tubing. All return gas is metered into the well. Built to handle 100 million feet of wet gas and to return 89 million feet of dry gas to the two horizons, a throughput of 95 million feet daily has been reached.

Operation of Plant

Wet gas is taken from the wells into the gathering system through a choke which reduces its pressure to about 2,000 psig. Its specific gravity is about 0.803, average, although varying from time to time. It then enters two parallel scrubbers after which the scrubbed stream is split before entering the absorbers.



Two parallel high-pressure absorbers are provided, each 31.5 ft. high by 60 in. diameter. From 45 to 47 million cubic feet of gas is introduced into each absorber. After scrubbing the wet gas, the distillate fraction condenses in the bases of the absorbers. A "chimney" permits the gases from the distillate to pass upward countercurrent to the downflowing absorption oil; the fat oil



Left: Reabsorber and two main absorbers. Right: Main lean oil-rich oil heat exchangers, at Sheridan plant

is caught on a drawoff tray above the tower bottom and does not mix with the distillate at all. About 80 to 85 g.p.m. is drawn from the tower bottom at a temperature of approximately 90° F. The fat absorption oil is about 110° F. when withdrawn; it flows at a total combined rate of 780 to 860 g.p.m. and about 90° F. temperature. The two absorption-oil streams are combined before entering flash tanks which contain a partition for separation of the distillate and fat oil but a common vapor space for accumulation of vapor.

Vented in Three Stages

They are flashed or vented in three successive stages of pressure reduction, eliminating the noncondensables, methane and ethane. Small quantities of desirable hydrocarbons are carried in the vented vapors. These are recovered in a reabsorption system so as to insure over-all recovery in the process.

Raw distillate from the last flash —where distillate and fat oil are kept separate, but where the vapors mingle in the lead-off line—is carried to a distillate stripper after being preheated at 65 psig. to 265° F. by the outflowing stripped distillate from the stripper bottom. A portion of this stabilized stream is withdrawn whenever necessary to a mineral seal-oil tower, where it is cut to specifications for absorber oil make-up. The remainder is disposed of as distillate. Overhead product from the distillate stripper passes into a special section of the fractionating still. The heavy ends condense and are caught on a drawoff tray and the liquid returned to near the top of the distillate stripper. Connected to the side of the stripper is a reheater with connection for steam stripping the distillate bottoms.

The three-times flashed fat oil is brought into heat exchangers with the lean-oil bottoms outgoing from the still, heated to 300°-325°. F. and flashed at 120 psig. in the fourth-stage flash tank, from which overhead vapors enter the still tower. Oil from the bottom of the fourth-flash stage enters the coil of a box-type heater, is flashed a fifth time at 470° F. and 80 psig. From this tank a small stream of stripped oil is processed continuously in a special oil conditioner to remove the accumulated sludge. The main oil stream is processed in the still and then withdrawn to exchange heat with the incoming fat oil, thence to the lean oil surge tank to repeat its cycle. The still is equipped with

(Continued on page 75)

TABLE 1—COMPOSITION AND AMOUNTS OF HYDROCARBONS IN 100 MM CU. FT. OF RAW GAS PER DAY

Hydrocarbon—	Mol. %	Mol./hr.	Lb./hr.
Methane	83.16	9,147.10	146,719
Ethane	6.73	740.00	22,252
Propane	3.85	424.60	18,721
Isobutane	0.84	92.40	5,370
Norm. butane	1.24	136.30	7,922
Isopentane	0.46	50.60	3,651
Norm. pentane	0.45	49.50	3,572
Hexanes and heavier	3.27	359.70	47,290
Totals	100.00	11,000.00	255,497

TABLE 2—YIELDS AND COMPOSITIONS OF MAIN PRODUCTS
(Gallons per hour)

Hydrocarbon:	Propane	I-butane	N-butane	I-pentane	gasoline	Distillate
Ethane	17	....	....	....	....	....
Propane	1,301	9	....	....	....	....
I-butane	19	864	31	....	....	....
N-butane	....	11	1,440	7	....	....
I-pentane	....	....	1	660	28	1
N-pentane	....	....	....	8	656	6
H-A	....	....	....	....	1,050	265
H-B	....	....	....	....	514	487
H-C	....	....	....	....	61	2,581
H-D	....	....	....	....	....	848
H-E	....	....	....	....	....	878
H-F	....	....	....	....	....	679
Total/hr.	1,337	884	1,472	675	2,309	5,740
Total/day	32,088	21,216	35,328	16,200	55,416	137,760

Memphis Natural to Complete Pipe-Line Looping Program

MEMPHIS.—Construction will begin shortly to complete looping the 18-in. natural-gas line of Memphis Natural Gas Co. from the Monroe, La., field to Memphis, a distance of 210 miles, according to H. L. Stowers, chief engineer.

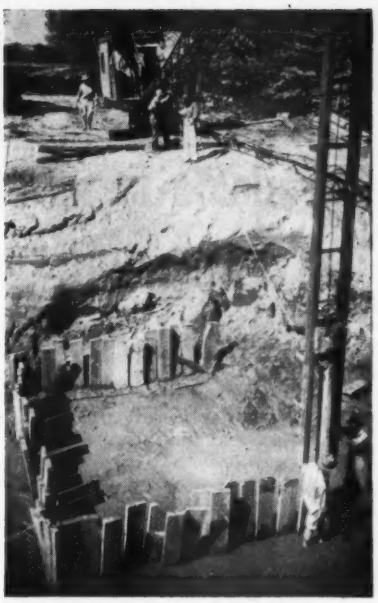
All except 61 miles in the system had been looped when court proceedings by the State of Louisiana held up construction. Following a favorable decision in the fall of last year, construction was resumed. By the first of the year the 31 miles from Robinson to the Lula, Miss., compressor station was completed, when weather conditions halted further work. This left two 15-mile gaps near Benoit, Miss., and Wilmot, Ark.

Of the approximately 15 miles of line from Cleveland, Miss., south to the Benoit compressor station, about 10 miles of 18-in. pipe is in service on top of the ground. It is believed this is the first time for a line of such large diameter to be operated without being buried. The line is functioning satisfactorily. Only 5 miles of this loop had been completed when weather conditions stopped construction. The pipe will be buried this summer, and the other 15-mile stretch from Eudora to Wilmot, Ark., will be completed.

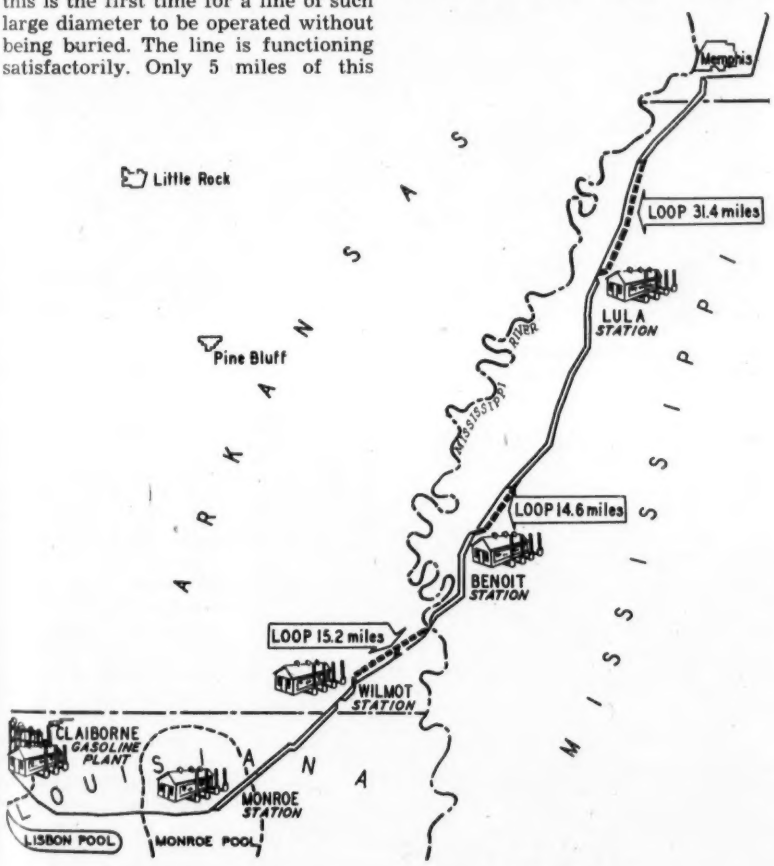
In addition to the two 18-in. lines into Memphis, the company has a 10-in. line from Memphis to Jackson, Tenn., which supplies gas for Jackson, Covington, Brownsville, Humboldt, and other points en route.

Takeoff at Greenville

Another 8-in. line takes off at Greenville, Miss., to supply that city, Greenwood, and points en route. A 6-in. line takes off the main line at Lake Village, Ark., to McGehee, which supplies these places and the surrounding territory. This gives the company a total of approximately 667 miles of pipe line. When completed, the line will hold 100,000,000 cu. ft. of gas at 400 lb. pressure.



The Mississippi River's vagaries can give plenty of trouble. On the east bank near Greenville, Miss., it piled up 25 ft. of sand and quicksand for ½ mile over the line. When a break developed it was necessary to have a pile driver build a cofferdam so the sand, silt, and water could be held while welders repaired the break



Map showing route of Memphis Natural Gas Co. line and looping program

Where the line crosses the Mississippi River at Greenville, on the upstream side of the bridge, there are four 10-in. lines under the river, each 3 miles long. The lines connect into a header station, on each side of the river, and one line can be cut out without interruption of service in case of trouble.

In addition to these lines, expansion work will be started in the summer to build 50 miles of 20-in. line from the Monroe field to the Lisbon, La., field to assure additional supply. Construction was started last fall on the Ouchita River crossing near Sterlington, La., and was halted by adverse weather.

The line from Lisbon to Monroe fields will carry a pressure of 700-750 lb., about twice that in the Monroe-Memphis lines.

All the gas for the system now comes from the low-pressure Monroe field, and four compressor stations are located at strategic points. The largest of these, of 10,000 hp., is at Monroe. The others are at Wilmot, Ark., 3,000 hp., Benoit, Miss., 3,900 hp. and Lula, Miss., 3,240 hp. The gas reaches the Monroe station from the field at 100 psi.

The major portion of the line is now protected against corrosion by cathodic prevention. Problems of line walking through swamps and difficult terrain have largely been eliminated by the institution of aerial patrol.

OIL-BASE MUD

Available in forms which can be built up into a wide range of specifications

by E. H. Short, Jr.

THE use of oil-base mud in Gulf Coast drilling operations is gaining momentum and the interest now being displayed both by those operators who have used it and those in the process of investigating its possibilities indicates that use of this type of drilling fluid should increase in the future.

Oil-base mud was developed shortly before the war; however, due to ensuing shortage of facilities and equipment, its early use was somewhat limited. Nevertheless, the results obtained in initial tests were so favorable that a number of operators placed oil-base mud high on their lists of materials for use or investigation in postwar development.

One type of oil-base mud was developed by the Shell Research & Development Co. after several years of research work, and is now being distributed in tank cars and tank trucks under a Shell patent by Halliburton Oil Well Cementing Co. Another product is manufactured by Oil Base, Inc., of Los Angeles and sold in 100-lb. bags. During the past year, the advantages of oil-base mud in certain types of drilling and workover operations (as indicated during initial tests) have been further substantiated.

Oil-base mud is now available in forms which can be built up into a wide range of specifications. It can be brought up to any viscosity or weight at the well to meet almost any conceivable drilling condition. Oil-base mud weight may be varied from 7.35 lb. to 18 lb. per gallon; and in cases of threatened blowouts it may be brought up to 20 lb. per gallon. Viscosities from 35 seconds on up to the maximum which can be handled by the pumps are possible with this type of mud.

Perhaps one of the first questions which might occur to anyone contemplating the use of oil-base mud is that pertaining to fire hazard. Those who have used oil-base mud are of the opinion that the high flash point of the oil used makes it unnecessary to take any greater precautions than would be termed reasonable. Despite the flash point of the oil (200°-240° F.) open fires on the derrick floor should be avoided; however, this would be a reasonable requirement regardless of the type of mud used in drilling. No-smoking signs should be posted and observed as a matter of reasonable precaution, and fire extinguishers should be readily available on any drilling rig.

Coring

Oil-base mud is not intended as a substitute for water-base mud in or-

Fig. 2—This unit contains two shale shakers, a desander, and a float-operated centrifugal pump for transferring oil-base mud from shale shaker tank to circulating tank shown in Fig. 1

Fig. 1—(Left) In background is rectangular circulating tank designed by Dansby Mud Engineering Service. The pump suction line is visible under the walk at the right end. Above the top center of the tank is a Warren Pit O Graf for recording level inside of tank. The sacks beside the tank contain ground oyster shell which was used to weight the oil-base mud to 10.5 lb. per gallon. The weighting material is added in the conventional manner through the hopper shown in the picture. The drums at left contain viscosity controlling chemicals

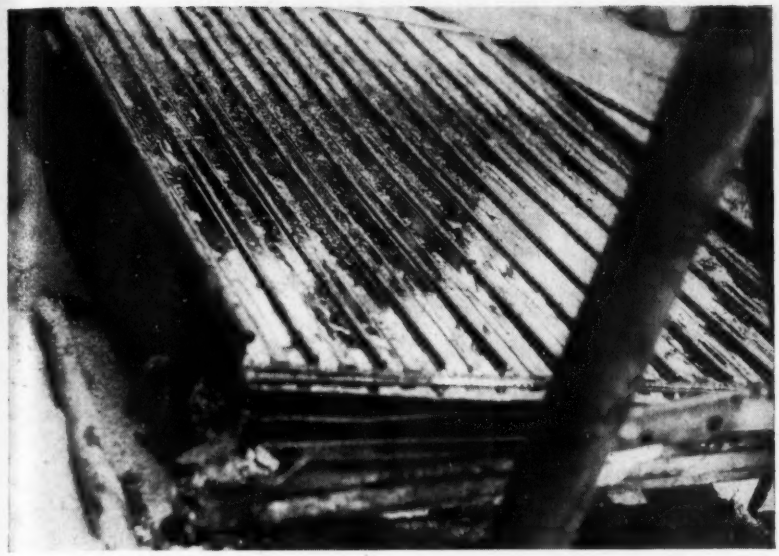


Fig. 3—Steel drain mat designed by Dansby Mud Engineering Service is used for racking drill pipe. The oil-base mud drains from drill pipe to mat and then to a trough to flow line. The drain trough and flow-line return are shown in foreground. This equipment was especially helpful in keeping the derrick floor clean. Due to care exercised by Stanolind at this location, all operations were as clean as conventional jobs

dinary drilling. It was designed primarily for increasing the efficiency of drilling and workover jobs where special problems are presented and in coring operations.

According to many engineers, one of the most significant advantages of oil-base mud is the one gained in respect to coring operations. The advantage is not a mechanical but rather a laboratory advantage, since accuracy of core analysis, especially in relation to connate water, is of great importance in the estimation of reserves. Also, upon the core analysis depend decisions regarding the feasibility of applying secondary-recovery methods. In connection with coring, the analysis of cores which have been taken from a thick sand section while using oil-base and water-base mud alternately should make an investigation well worth the additional time required to follow such a procedure.

Low-Pressure Completions

In low-pressure completions where high-filtrate-loss water-base mud is used a considerable amount of water can be lost into the producing formation and usually blocks the free flow of oil production into the bore hole. When the sand becomes water logged it is often necessary to spend considerable time to complete, which may involve swabbing or shooting, or both. When oil-base mud is used, no water is lost into the sand, and the formation is open. Under ordinary circumstances a well completed in this manner comes in without the necessity of swabbing or shooting.

The use of oil-base mud appears particularly adaptable to workover of wells in old fields where the producing formation is largely depleted. In areas of this type it is of great importance that water be kept out of the sand, and the use of oil-base mud offers a means of cleaning out and resetting screen liners without loss of water into the sand.

Fig. 4—R. E. Dansby, Dansby Mud Engineering Co.; Ellis Watson, Stanolind toolpusher; R. B. McCloy, Stanolind Oil & Gas Co., and Tom Keating, mud engineer, Stanolind Oil & Gas Co.

Salt-Water Flows

Another specific drilling problem for which oil-base mud offers considerable advantage is in cases where salt water flows are encountered during drilling. It has been used with satisfactory drilling results where contamination amounted to 20 per cent.

Heaving Shale

Sections of heaving shale have been drilled in a number of Gulf Coast wells with oil-base mud and caliper surveys have shown that bit-sized holes were maintained throughout the sections.

It is unnecessary to discard oil-base mud after being used in one well. It can be placed in a storage tank and used in drilling other wells. In some cases it may be necessary to change character of the used mud to meet viscosity and weight requirements. Operators who have used oil-base mud state that it has remarkable qualities for jell forming which permits retention of cuttings.

Field Experience

One of the most recent oil-base mud completions on the Gulf Coast was the Stanolind Oil & Gas Co. 7 Pattison in the North Katy field, Waller County, Texas.

This well was drilled with Stanolind tools and supervised by company personnel. Two production zones are encountered in the North Katy field, and the well was drilled to the top of the first sand with water-base mud where 7-in. casing was set. While waiting on cement to set, the special equipment necessary for handling oil-base mud was rigged up. The plug was drilled with oil-base mud and both the first and the second sands were cored. In the case of this well, oil-base mud was used primarily as a means of obtaining uncontaminated cores.

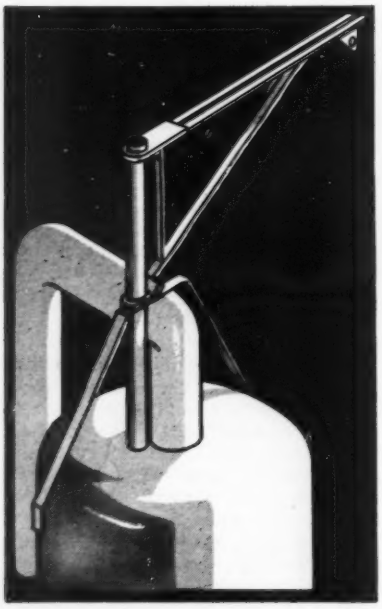
Use of oil-base mud requires a small amount of special equipment. This includes a covered rectangular steel mud tank having a capacity of 150 bbl., a steel drain mat for racking drill pipe, and a float-controlled centrifugal pump for continuously transferring the mud from the shale shaker tank to the circulating tank. Reserve oil-base mud storage was provided by a 250 bbl. conventional storage tank. The circulating system was completely covered to prevent contamination with rain water.

PLANT PRACTICES

Permanent Gin Pole For Tower Top

TO avoid necessity for installing a temporary gin pole each time a tower is cleaned or inspected, a permanent gin pole with bearings, so that it can be made to revolve around the tower by means of the fall line, has been provided. In the installations referred to a 4-in. by 4-in. by 16-ft. pole was erected each cleaning or inspection period. Scaffold material must be raised each cleanout time; 6 ft. between the top of the tower and the gin-pole level is ample for handling scaffold material.

The vertical riser standard is a 4-in. standard weight pipe section welded to the tower top. It is braced by diagonal pieces of angle iron, such as 2½ in. by 2½ in. by ⅜ in. at its vertical



midpoint, welded to the edge of the tower wall. The horizontal arm is two 2 by 2 by ⅜-in. angle irons, at the inner end of which is welded a ½-in. plate with a hole cut slightly larger than the 4-in. vertical standard and slipped over that standard. At the outer end is welded two parallel irons through which holes are drilled so a block may be attached. This horizontal arm is braced at about 45° angle with one piece of the same size of angle iron, to the inner end of which another plate drilled to serve as a bearing on the vertical standard, and its extension bent at the same angle from the horizontal as that of the brace. A vertical brace between this brace inner end and the inner end of the arm is installed, of the same or other angle iron. Three or more of the braces to the vertical standard may be used. *(Idea submitted by F. B. Savage, carpenter, Humble Oil & Refining Co.'s "Coin Your Ideas" contest).*

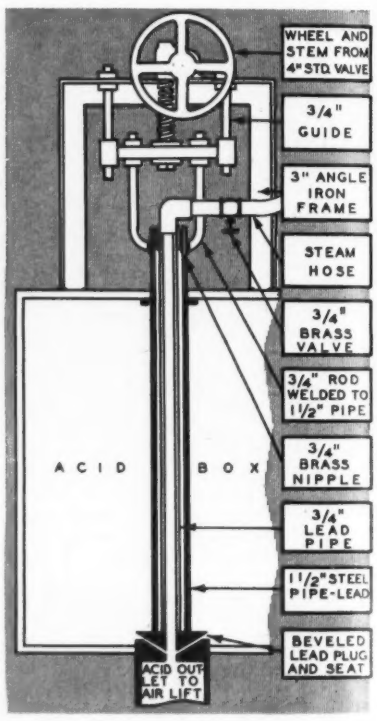
Roll Gasket Containers Prevent Deterioration

THIS rack of roll-type gasket containers is installed by a major operator for three gasoline plants operating in Wichita County, Texas. Constructed of lightweight 10 and 12-in. pipe, the cylinders are split in the center, closed on the ends, and hinged on one side. The containers prevent damages to gasket material from flattening, cracking, and saves undue dust and dirt accumulations.

Means For Raising Acid Tank Valves

IN handling many liquid materials, such as sulfuric acid, the valves or lines may become plugged or stuck, requiring shutdown of the entire operation until the stoppage is cleared. A method for raising and lowering such valves has been developed which reduces downtime to a small fraction of that required otherwise.

In the method shown in the drawing, a 1½-in. pipe, covered with corrosionproof material if necessary for its preservation, is welded or otherwise fastened securely to the top of the plug. Inside this a ¾-in. pipe is fastened—lead when handling acid—also to the top surface of the plug, a packing gland being fitted at the point it emerges from the larger pipe. A fitting for a steam hose or other agent for cleaning the valve or line is attached at the top of this ¾-in. pipe. Two yokes of ¾-in. rod are welded to the 1½-in. pipe, ending in clamps around a 2-in. horizontal bar. On the top of the tank a 3-in. angle-iron frame is welded. To the end of the bar drilled guide blocks are fitted, sliding over ¾-in. guide rods fastened to the frame's horizontal bar. The lower end of a threaded stem from a wheel-



operated valve assembly, such as a 4-in., is fastened to the horizontal bar immediately above the double pipe extending above the valve. The wheel and turning mechanism are fastened to the horizontal angle bar of the support frame. By turning the wheel the valve may be raised, the cleanout mechanism attached and used, and the cleaned valve may be lowered in a very short time without shutting down operations. *(Idea submitted by H. L. Crosby, in Humble Oil & Refining Co.'s "Coin Your Ideas" contest).*

Check Your Tube-Still Refractory-Lining Maintenance Program

by ***H. O. Johanson****

Maintenance problems for properly designed furnaces center about certain locations, fire, peep and explosion doors, joints, corners, etc. This article outlines methods for repairing, maintaining, or eliminating these problems, indicates choice of materials, and gives other advice useful to the refinery operator who must carry on successful maintenance schedules.

PRIOR to 1930 most refinery tube stills were built with flat suspended arches and solid fire brick walls. Suspended air-cooled walls were used only on tube stills on rare occasions.

Many refiners had used air-cooled suspended walls for their boiler settings, but had not used them on their tube-still settings due to the greater wall area and the problems involved in using the preheated air from the air-cooled walls for combustion without auxiliary equipment and fans. It was also felt that the low temperature and low heat release in a tube still did not warrant the use of an expensive air-cooled suspended wall. However, due to the short cycle of operation and the frequency of bringing the tube still on stream and cooling it off the large and high solid walls were giving constant trouble and were always a source of maintenance problems.

About that time a design of suspended wall backed up with insulation was made available to the industry by one of the leading arch and wall manufacturers, and as of 1940, or only after a period of 10 years, most all the tube stills were built using insulated suspended walls, and solid fire-brick walls were of the past.

*M. H. Detrick Co.

One reason for the swing to insulated suspended walls was the reduction in tile thickness which reduced the cost of the suspended walls. In many cases an insulated suspended-wall installation cost less, erected and in place, than walls of solid fire-brick construction. Another reason for the trend toward insulated suspended walls was that the refinery operators had learned they could bring a suspended-wall-lined tube still on stream and also cool it off in less than one-half the time required with solid walls, with no effect or maintenance on the refractory lining.

As, by far, the greater percentage of tube stills now in operation are of suspended-wall construction, backed up with an insulating material on the outside, this article is written to assist the refinery operators in the care and maintenance of their tube-still refractory lining.

The major source of maintenance in suspended walls is around door openings such as access, explosion, and peepholes, around intermediate tube hangers both wall and roof, around end tube sheets and at the corners of the wall, such as the lap of the side wall to the front wall. There should be very little or no maintenance on the suspended-wall areas with no openings if it is properly designed and erected.

Doors

The access and explosion door openings give greater trouble than the peephole openings, due to their larger areas. Door trouble can be greatly reduced and at times eliminated by filling the door opening with fire brick, preferably insulating fire brick, because of its lighter weight. This can be done even though the access door has a peephole opening, as the desired vision can be obtained by leaving a small opening in the brick fill.

There has been considerable discussion whether or not the usually small explosion doors in a tube still are of any value, as they are not of great enough area to relieve anything greater than a very small explosion. One of the leading refinery-engineer-

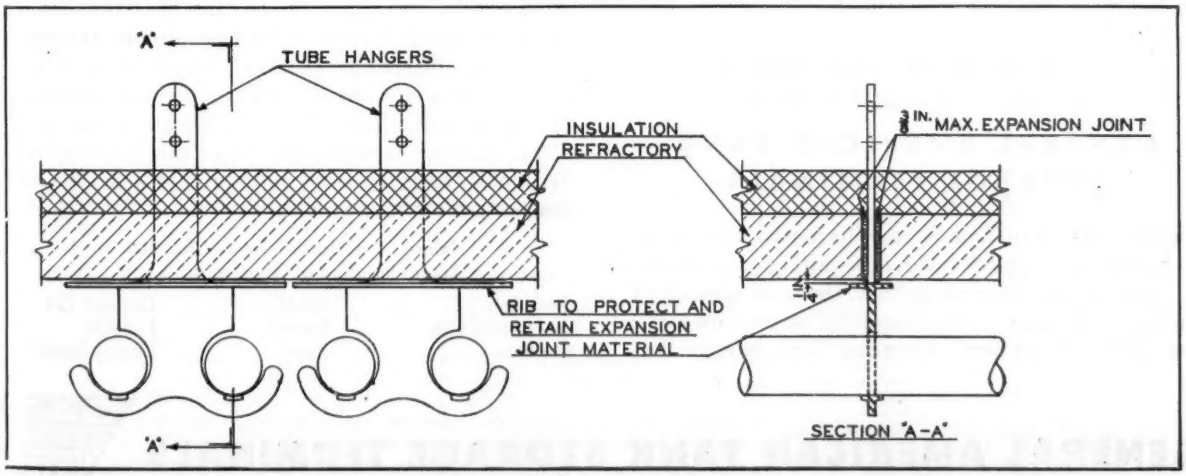


Fig. 1—Details of design of tube hanger assembly and surroundings, showing expansion joints, joint protecting ribs, etc.

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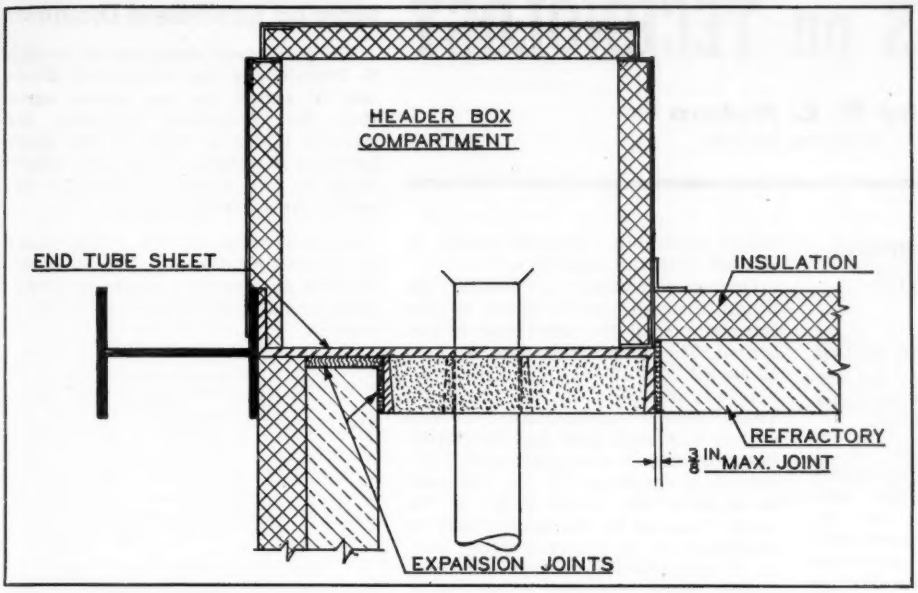

Fig. 2 — Cross-section of header-box compartment of a tube still, showing common locations of maintenance problems

ing companies has recently done away with explosion doors altogether in the furnace proper.

Some refiners lay up the suspended-wall tile around door openings in high-temperature cement and this is considered very good practice.

Intermediate Supports

The maintenance troubles around intermediate tube supports and hangers can be caused by a number of reasons; the design of the suspended arch or wall, the method in which the arch or wall tile is installed, and the design of the tube support itself.

The arch and wall tile, as a rule, are field cut around the tube hangers and the openings packed with an expansion-joint material. If these openings are cut too large, the expansion-joint material can fall out; and if the openings are cut too small, the movement of the intermediate tube hangers may break the tile, allowing them to fall out. Great care should be taken when installing and cutting the tile around intermediate tube hangers. The width of the openings varies with the design thickness of the intermediate tube hangers, but should not be more than ⅜ in. on each side of the hangers. (See Fig. 1.) This joint should be inspected occasionally and repacked when necessary.

The correctly designed intermediate tube hanger should have a rib or shelf to protect the opening and retain the expansion-joint material. (See Fig. 1.)

End Tube Supports

A great deal of the refractory lining difficulties at the end tube supports can be traced to improperly packed expansion joints. These joints, some of which are open joints, should be inspected and repacked when necessary. (See Fig. 2.) This applies to both wall and roof end tube supports.

Some of the refractory arch trouble at the end roof tube supports is caused by the deflection of the steel supporting the tube sheets, header-box compartment and the suspended arch. This trouble and deflection is caused by fires inside the header-box compartment which overheat the steel. This source of maintenance can be reduced and at times eliminated by insulating the steel forming the header-box compartment.

Corners

The corners of the refractory lining in a tube still can be, also, at times, a source of maintenance problems. The corners referred to are where the side walls lap the front wall, rear wall, or bridge wall. This trouble can be eliminated by a correctly designed offset joint. This joint should also be inspected and repacked occasionally.

There are a great number of different materials used for expansion and packing joints, but a mixture of 50 per cent broken block insulation or plastic insulation mixed with 50 per cent fire clay, by weight, seems to stand up better than most materials. This mixture has expansion qualities, will withstand temperature, and has the strength and body to stay in place.

If the horizontal expansion joints in the suspended wall are in need of repacking, it is well to use this same material.

The refractory lining of a tube still should be kept absolutely tight and all expansion joints should be inspected occasionally and repacked when necessary. It is considered good practice to inspect carefully the entire arch and wall area, and if there are signs of leakage to point up, paint or coat the entire areas with a high temperature cement or coating material. Leaks can be detected easily by the discoloration at the joints of the tile where the leakage occurs. It is a sooty color caused by the mixture of the air leakage with the hot gases. A leak through the arch or wall may cause late or secondary combustion, and if this is near a still tube it will cause outside oxidation of the tube and reduce its life.

The five reasons which may cause failure of a refractory-lined wall are: melting, softening, fluxing, spalling, and expansion. Due to the low temperature in a tube still, melting and softening are factors that need no consideration. Fluxing is strictly a refractory problem and can always be eliminated by proper selection of refractories; however, as fluxing is caused only by the heavier and dirtier fuels, it is only in rare instances that it is a problem in a tube still.

Spalling and expansion problems can be eliminated entirely with a correctly designed suspended arch and wall, and if the arch and wall tile are installed in a proper manner. A correctly designed arch and wall should be one of small units of tile as large tile will spall. Installing the arch and wall tile in a proper manner means careful laying and handling of all tile and care taken that each section has its proper expansion; without proper expansion spalling can occur.

Suspended walls are used extensively in the lining of fluid catalytic regenerators and kilns. The maintenance of suspended walls for this type of unit is entirely another subject and will, in all probabilities, be treated as such at a later date.

BOOKS

ROCKY MOUNTAIN PETROLEUM YEAR BOOK FOR 1945, Petroleum Publishers, Inc., 730 Seventeenth Street, Denver, 390 pp.

The 1945 edition contains a number of articles on geological aspects of various parts of the Rocky Mountain area by well-known authorities in that region. In addition to production statistics by pools by years, for many of the outstanding fields of the region, there are lists of key wildcats, dry or productive, and many key field wells, for several of the states, that are very comprehensive. Names and addresses of producers, drilling contractors, consulting geologists, geophysicists, petroleum engineers, service companies, natural-gas distributors, and oil-field equipment and supply companies are included.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Simplified Flow Diagrams Drying of Liquids With Adsorbents

In your question of March 30, 1946, you mention the use of clay for drying liquids. Can you give us a diagram of such a process?—B.F.R.

The drying or dehydration of liquids has not assumed the importance that the drying of gases has occupied. Nevertheless, during the war the production of nitrogen-grade toluene and benzene, and the isomerization of butane required the production of water-free products. In general, water-free feedstocks are important in any processes which utilize anhydrous catalysts because with wet feedstocks the catalyst must be currently dehydrated in order to maintain efficiency.

The dehydration of liquids is practiced in almost the same manner as the drying of gases except that more time is required for regeneration of the adsorbent. Thus, while one chamber is in service, another may be nearly spent or may be in process of being drained of valuable liquid, while a third chamber is being dried. In addition, the feedstock is usually fed upward through the chambers so that slugs of water or caustic-laden liquid settle out before it comes in contact with the adsorbent.

Operation consists of passing the liquid through one or more of the chambers until the adsorbent is saturated. The chamber is then drained of liquid and if the liquid is valuable it is steamed from the adsorbent. The adsorbent is then dried by means of hot fuel gas, flue gas, or superheated steam. A temperature of 300°-400° F. is employed for the gas used in drying. The main bulk of the water removed by the hot gas may be condensed by means of a water cooler. A simplified flow diagram illustrating these principles is shown in Fig. 1. Liquid flows at the rate of 4-16 gal. per hour for each pound of clay in the chamber. The clay is supported at several points in the chamber to allow settling of any impurities and to prevent channeling.

Gasoline, kerosene, etc., can easily be dehydrated to less than 30 p.p.m. of moisture. If frequent regeneration is practiced, the moisture content can be reduced to these low values:

	p.p.m.
Naphtha	2-4
Toluene	10
Benzene	4

Almost any of the common fuller's earths may be employed and bauxite is widely used.

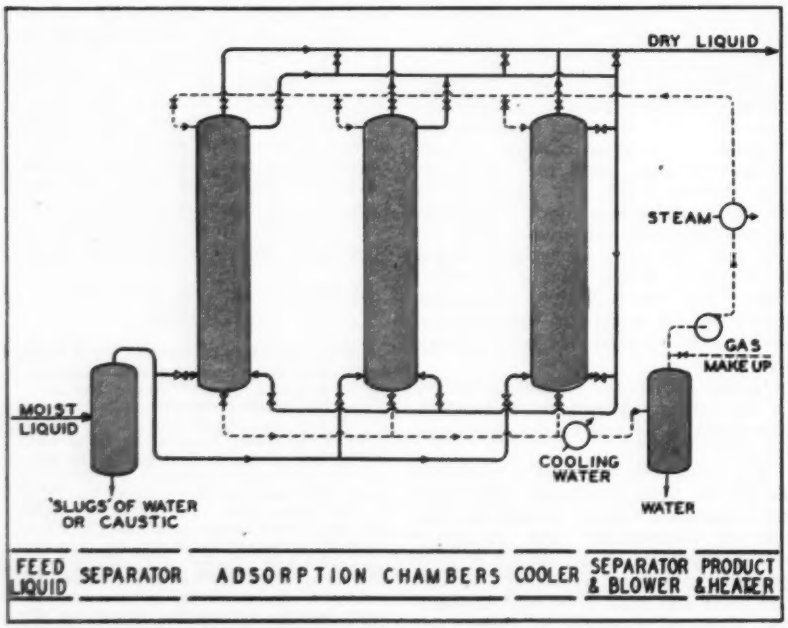

Fig. 1—Simplified flow diagram of drying of liquids with adsorbents

More on Equivalent Diameter

We read your discussion of March 9, 1946, about the equivalent diameter of annuli but we cannot agree that the equivalent diameter for parallel plates is equal to the space between the plates. It is more nearly equal to two times the distance between the surfaces.—A.J.S.

Consideration of the mathematics of computing the equivalent diameters of passageways whose walls exhibit parallelism shows that A.J.S. is correct.

$$d' = \frac{4 \cdot \text{Area}}{\text{Perimeter}}$$

For concentric circles—

$$d' = \frac{4 \cdot \frac{\pi}{4}(D_1^2 - D_2^2)}{\pi (D_1 + D_2)} = D_1 - D_2$$

For concentric squares or congruent rectangles—

$$d' = \frac{4 (D_1^2 - D_2^2)}{4D_1 + 4D_2} = D_1 - D_2$$

It will be noticed that $D_1 - D_2$ is not the space between the surfaces. It is double the space between surfaces.

Flow between parallel plates, or between the edges of two tubes that are parallel to each other (as in an exchanger) is the same as above except for the ends of the passageway created by the cross baffles. The cross baffles, however, have little effect until the baffles are spaced very close together (2 or 3 times the space between tubes). Thus in almost all exchangers the equivalent diameter is about twice the space between tubes.

"Drifting" Exchanger Tubes

In your answer of February 9 you observe that "difficulties in constructing tube rollers for diameters less than ⅝ in. makes some other method more feasible." This may have been true in the past, but we believe the necessity for drifting small-diameter tubes is a thing of the past.—D.S.M.

Apparently there is a difference of opinion among heat-exchanger manufacturers regarding the feasibility of rolling small-diameter tubes. D.S.M., of Ross Heater & Manufacturing Co., continues by stating that thousands of units have been made by his company for the Navy which have ⅜-in. 18-gage tubes, as well as thousands of small exchangers which have ¼-in., 20-gage tubes, all roller expanded and in many instances the exchangers met the rigid requirements of the U. S. Navy. The general run of petroleum-refinery and chemical-industry exchangers have ¾-in. and 1-in. tubes.

Depleted Sands Provide Floating Gas Storage

(Continued from page 59)

return to the Tensleep sand, for pressure maintenance, of a volume of gas approximately equivalent to that produced from this sand, gas lifting of wells, and operation of the field residue system supplying fuel for pumping engines and compressors, heaters and boilers, and miscellaneous camp and field use. The residue system alone takes from 1,700,000 to 2,000,000 cu. ft. of gas daily. This, with an average of around 435,000 cu. ft. being used daily at this time for gas lifting of wells, and about 750,000 cu. ft. daily being returned to the Tensleep sand, places the total field requirements from 2,885,000 to 3,185,000 cu. ft. daily, as compared with the current production recovery of about 1,550,000 cu. ft.

Production gas taken from the field separators and bradenheads of pumping wells is delivered in an atmospheric-pressure gathering system to a central booster station, from which, along with supplemental gas from the main system, it is distributed in different stages of compression to the various field uses. The gathering system centers in a main 12-in. and 10-in. line (12-in. through the plant) that extends the length of the field. A meter is installed on the 12-in. line on each side of the plant to determine whether the system is pulling too heavily from one end or the other.

Booster Station Equipment

The booster station contains ten 170-hp., two-cycle, 200-r.p.m. gas engine compressors. Seven of these are equipped with a 16 by 20-in. cylinder taking suction from the 12-in. main gathering line at atmospheric pressure and discharging to a 50 psi. header, and an 8½ by 20-in. cylinder taking suction from the 50 psi. header and discharging through a dehydration unit to a 275 psi. flowing well header. One compressor has two 7¾ by 20-in. cylinders, both of which take suction from the main gas-supply line, operated at 50 psi. pressure and discharge in single-stage compression to the 275 psi. header. It is provided to relieve the first seven compressors of having to handle the supplemental gas taken from the main system. The remaining two compressors are equipped with 5½ by 20-in. and 4½ by 20-in. cylinders. The low-side cylinders take suction from the 275 psi. header and discharge at 450 psi. pressure to the high-side cylinders, which in turn discharge to a 1,500 psi. header.

Low-stage compressors are designed to handle 5,000,000 cu. ft. of gas daily at 3 psi. intake and 275 psi. discharge pressure. Operating at atmospheric suction pressure they have a capacity of approximately 4,000,000 cu. ft. daily. The two high-pressure compressors have a capacity of approximately 3,500,000 cu. ft. daily, at present, intake and discharge pressures.

The 1,500 psi. gas is used for injection in the Tensleep oil sand for the pressure-maintenance program now being carried out. At present, the gas, approximately equivalent in volume to the withdrawal, is being returned through a single input well (No. 95) located near the plant. The 275 psi. header, in addition to providing the suction of the two high-pressure compressors, supplies the gas needed for gas-lifting operations. This header is equipped with a pop valve to the residue system which takes any gas in excess of gas-lift and pressure-maintenance requirements, and thus prevents the chance of any building up of pressures in the high-pressure systems.

Pressure on Residue System

In warm weather, a pressure of approximately 50 psi. usually is held on the residue system. In cold weather, when withdrawals generally are greater on the average, it usually is desired to maintain the pressure around 25 psi. In addition to the pop valve from the 275 psi. supplying excess plant gas, the residue system has a direct connection from the main gas system entering the field to supply the supplemental gas needed for general field use.

Gas from the main system enters the field through a central master gate and metering station where the volume of outside gas to the various field systems is controlled. In the header control there is a main 8-in. line with leads to the compressor plant and to the residue system, and a 2-in. line supplying fuel to certain separate leases not included in the field unit. From the 8-in. line there also is a 4-in. bypass to permit reversing the flow of gas in the field system to feed instead of draw from the main system, if desired.

Tied into the field residue and gathering systems are a number of "storage" wells into which any gas in the residue system in excess of field immediate requirements is injected to provide a reserve to take care of day-by-day fluctuations in consumption without having to be varying at all times the volume taken from the main system. These wells, serving as "breathers," more or less float on the residue system and do not require metering of the gas input and withdrawals.

At present 12 wells are being used for this purpose, 9 of them being in the north and 3 in the south end of the field. All are former producers in shallow sands that since have been virtually depleted. Of the three wells in the south end, all in close proximity, two are serving as input wells with all withdrawals being taken from the third. In this it is anticipated that the migration of the gas from the two input wells to the output well will have a certain "washing" effect that will serve to recover any oil that might be left in the sands. The nine wells in the north end are individually both input and output wells with withdrawals being made either direct into the residue system or into the gathering system as desired.

New Cycling Plant Conserves Gas

(Continued from page 62)

a special section and drawoff near the top, where the steam condensate is caught and withdrawn from the system.

Overhead vapors leave the still top at 200° F., pass through a primary condenser to liquefy a portion which supplies the reflux tank, the remainder of the overhead being condensed in the final condenser and entering a run tank. This raw product is pumped in heat exchange with the final gasoline stream and with the rectified tower bottoms in separate exchangers, and is flashed in the rectifier at 450 psig. and 230° F. Here an overhead stream is taken off at 135° F., a portion of which is condensed and returned as reflux, the remainder going as vapor to the booster gas stream. Rectified bottoms are stripped at 290° F., pass in exchange with the incoming raw product, and are flashed in the depropanizer tower at about 240° F. Propane is taken overhead at 235 psig. and 124° F. amounting to 40,000 lb. or more per hour at capacity.

The depropanizer bottoms at 280° F. are flashed at 125 psig. in the debutanizer, where butanes are taken overhead. All of this overhead stream except the reflux is taken to the butane "splitter" tower where isobutane passes overhead from the 100 psig. tower to be condensed from 130° F. to storage temperature and sent to storage. The normal butane is reboiled at 155° F. and passes to storage.

Bottoms from the debutanizer at 305° F. are precooled to 200°-215° F. and flashed in the deisopentanizer. Isopentane comes overhead at 155° F., and 35 psig. The isopentane is cooled in a primary condenser to condense reflux liquid, then finally to liquid isopentane which goes to storage. The deisopentanized gasoline exchanges heat with the unrectified raw gasoline, passes through a cooler coil and then to storage.

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The Relation Between
WELL SPACING AND RECOVERY

by W. V. Vietti,* J. J. Mullane,† O. F. Thornton,* and A. F. Van Everdingen‡

ABSTRACT

THE authors conclude that no correlation exists between well spacing and recovery for the Mexia-Powell fault-line fields, and that recoveries obtained by open-flow production from areas within a reservoir cannot be used to derive or substantiate a mathematical relationship between spacing and recovery for the reservoir.

There exists a difference of opinion as to the effect of spacing upon recovery. Some authors contend that there is a mathematical relationship between the two. Such a relationship was recently proposed, based on recovery from the Mexia-Powell fault-line fields. A critical review of the information on these fields by the authors shows that the data cannot be used to derive such a formula. The differences in unit recoveries are small, and are attributable to factors other than spacing.

Recoveries from areas of different spacing within a field heretofore have been used to derive or substantiate formulas relating spacing and total recovery. This procedure is incorrect, as the differences in recovery exist because per well-producing rates are not related to the volume of pay or to the recoverable oil attributable to the well. The amount of the resulting drainage cannot be calculated easily, but in some cases may be approximated by assuming equal recovery per well.

The choice of well locations (spacing) should be based upon the principles which govern reservoir performance, and not upon empirical formulas proposed in the early days of the petroleum industry.

This paper was presented orally by W. V. Vietti at the twenty-fifth annual meeting of American Petroleum Institute, at Chicago, November 1945.

EXPERIENCE obtained early in the history of the petroleum industry during the period of "wide-open" production led to a belief that the ultimate recovery from a reservoir depends largely on the number of wells drilled. Careful studies of well spacing, however, have indicated that ultimate recovery is substantially independent of the number of wells.[1]

In a recent paper Clark, Tomlinson, and Royds[4] revived this early belief. They proposed that well spacing does affect recovery; that increased well density results in increased recovery, and that there is a definite mathematical relationship between the two. This conclusion was based primarily upon data from the Mexia-Powell fault-line fields by Hill and Guthrie[5] and also upon information for the Lucien, Hewitt, Healdton, and Oklahoma City fields in Oklahoma, and the Chase Townsite pool in Kansas. The formula proposed by Clark et al states that the recovery per acre-foot from a given reservoir is inversely proportional to the square root of the well spacing (acres per well). The formula is a restatement of the Cutler[6] rule.

That such a wide difference of opinion as to the effect of well spacing upon recovery should exist among the well informed is particularly disturbing to management in the petroleum industry and to the layman.

The purpose of this paper is to analyze the basic data used by Clark, Tomlinson, and Royds, and to determine whether a valid basis exists for such a far-reaching conclusion as their proposed square-root (Cutler) rule, particularly as it is contradictory to rather well established principles of reservoir behavior.

Cutler's Rule of Well Spacing

Clark, Tomlinson, and Royds refer to the suggestion made by W. W. Cutler[6] in 1924 that per-well recoveries under different spacings are related to the average distance the oil has to move to reach the well. Several factors relative to Cutler's statement should be pointed out.

The intrafield data used by Cutler were from the Nowata, Bartlesville-Dewey, Hewitt, Bartlesville, and Glenn Pool fields in Oklahoma, and the Speechly and Buena Vista Hills fields in Pennsylvania and California, respectively. These were all predominantly dissolved-gas-drive reservoirs, which were in part lenticular and noncontinuous. This fact was recognized by Cutler when he stated " . . . it is evident that the recovery will be approximately proportional to spacing whenever the primary expulsive force is gas and the reservoir rock is continuous throughout the area under consideration." It becomes obvious on inspection that, when the volume of the reservoir is continuously changing as in water or expanding gas-cap-driven fields, relative spacing (density) is secondary to structural position of the well as a factor in recovery.

Cutler's rule is stated as follows: "The ultimate productions for wells of equal size in the same pool, where there is interference (shown by a difference in the production-decline curves for different spacing), seem approximately to vary directly as the square roots of the areas drained by the wells," or, " . . . is proportional to the average distance that the oil moves to get to the well."

Cutler attempted to approximate differences in recovery between areas of different well density in a common reservoir. Students of this problem today recognize that these differences may exist because of drainage by closely drilled areas of those less closely drilled. Moreover, even though Cutler's rule may be correctly applied to one reservoir, it cannot be applied to recoveries from two or more fields of different spacings. Many have erred in attempting to so use it.

For fields wherein the sand thickness is uniform, Cutler's rule may be restated that the ultimate recovery per acre-foot of sand drained by a well varies inversely as the square root of the area drained by the well. This is the analog, but restricted to apply only between wells in a given field (total recovery fixed) to the mathematical relationship by Clark, Tomlinson, and Royds proposed to relate total recovery to spacing.

The Cutler rule was reviewed by H. C. Miller and R. V. Higgins' in 1939. The following comparative re-

*The Texas Co. †The Carter Oil Co. ‡Shell Oil Co., Inc.

view is based in part on the work of Miller and Higgins.

1. Cutler's rule is based on "wells of equal size." This refers to wells which produced the same quantity of oil for the first year under wide-open conditions. It does not refer to prorated production.

2. "The same pool," as used by Cutler, meant not only the same field, but the same reservoir in the same field. Stretching the Cutler rule to cover different fields and to encompass all the reservoirs in one field surely is not a restatement of the Cutler rule.

3. "Interference," as used by Cutler, is defined as "a difference in the production-decline curves for different spacings." Here again a single, continuous, and intercommunicating reservoir is indicated. Cutler recommended (if we may interpret) the drilling of wells sufficiently close so that there would be interference, but did not go beyond the spacing where interference reduced ultimate production per well. His remarks on the Bartlesville-Dewey district are quoted: "In order to properly drain the tracts in this field, the ultimate spacing per well should not be greater than 7 acres." Ultimate production per well became smaller at closer than 7-acre spacings in this district, according to the data presented by Cutler.

4. Cutler also limited his rule to the condition, "whenever the primary expulsive force is gas." Reservoirs studied by Cutler were shallow, low-pressure and, therefore, low in dissolved-gas energy, low temperature, and are low in both porosity or permeability.

5. We quote Miller and Higgins:

(a) "In other words, the recovery of oil from a pool as a whole may not be increased necessarily, because relatively high recoveries are obtained from certain closely drilled tracts within the productive limits of a field." (P. 14, Bureau of Mines Report of Investigations 3479.)

(b) "Any assumption that the rule applies in general to all pools, regardless of type and method of producing them, cannot be accepted as true, because such a supposition fails to take into consideration the dissimilarity and complexity of oil-producing reservoirs and the fact that the behavior of deep-seated, high-pressure reservoirs undergoing depletion differs widely from that observed by Cutler in those shallower, lower-pressure pools on whose performance the tentative rule was based originally." (Concluding sentence, p. 20, Bureau of Mines Report of Investigations 3479.)

Mexia-Powell Fault-Line Fields

The fault-line fields, producing from the Woodbine sand in Texas, were discovered in the period 1921 to 1924, and were quickly developed. Encroachment of edgewater was early and at a rapid rate. The initial production rate probably exceeded the rate of water encroachment, but the settled production was undoubtedly under water drive. As pointed out by Clark et al, the fields are similar in a number of respects, and they provide the subject of an interesting comparative study. Many of the methods now commonly used to obtain subsurface information, such as electric logging, core analysis, subsurface sampling and analysis, and bottom-hole pressure recording, unfortunately were not then in use. Therefore, any study must be based on meager data concerning sand volume in particular.

Some electric logs have been obtained from comparatively recent drilling on local "highs." Those contained in the Hill and Guthrie report number: four in Mexia, one (incomplete) in Wortham, three in Currie and North Currie, two in Richland, and one in Powell. The analysis of only one core sample from an upper Woodbine sand-stringer (not the main pay) was available. Oil-production data by leases, drillers' logs, completion data, and maps showing wells making water were other data given.

To show the features of the Woodbine in the fault-line area, a cross-section has been prepared (Fig. 1) from the available electric logs. . . . The Woodbine sand has a well-defined electric-log pattern of high natural potential and resistivity readings. . . . Currie and Richland produce from the "Main" pay, which is the first 40 to 50 ft. below the contoured surfaces. Mexia, Wortham, and Powell produce also from stringers above and below the main sand. The Currie field is shown as having a gas cap above the elevation of approximately 2,520 ft. below sea level.

Inspection of the data obtained by Hill and Guthrie, and presented in their report, shows a multiplicity of reservoirs in each fault-line field. The presence of continuous shale breaks, "main pay," "big pay," gas zones, upper and lower sands, variable or indeterminate water-oil contacts, substantial differences in gravity, dry holes within the productive limits, and the gagging together of oil from the Morrow or Corsicana and Nacatoch, all make these fields unsuitable for mathematical reservoir analysis.

Clark, Tomlinson, and Royds state these fields provide the equivalent of a laboratory demonstration of effect of spacing upon recovery, in that all factors other than well spacing are the same. A review of data published by Hill and Guthrie shows many other factors were variable between individual fault-line fields and pay sands in the same field. The other factors which did influence recovery from the fault-line fields are outlined in the sections which follow. The interpretations by Hill and Guthrie seem to have been based primarily on drillers' logs. The present reviewers do not accept the interpretation of original water-oil and gas-oil contacts or net pay-sand thicknesses in the reservoirs. No correlation between well spacing and recovery remains after allowing for the influence of the other factors. The small differences in unit recoveries are attributable to factors other than spacing. The recovery data cannot be used as the basis for an empirical formula.

Mexia Field

Reference to Fig. 1 (and also to the generalized section, Fig. 2 of R.I. 3712) shows the Woodbine at Mexia to be composed of an upper pair of thin sands, 7 and 5 ft. thick, and the main sand zone beginning at 2,440 ft. below sea level. These sands differed markedly in producing characteristics.

The authors of R.I. 3712 state on p. 67: "The absence of a water drive in the two upper sandstone strata was recognized early in the life of the Mexia field, and production from these beds probably will be less than 200 bbl. per acre-foot. On the other hand, the main Woodbine producing sandstone was underlain by water, an active natural water drive was recognized in this bed, and quantity of oil that will be recovered ultimately per unit volume of reservoir rock probably will be three or four times that from the upper two sandstone strata. Therefore, when comparing performance of wells in the Mexia field with the other fault-line fields,

(Continued on page 82)

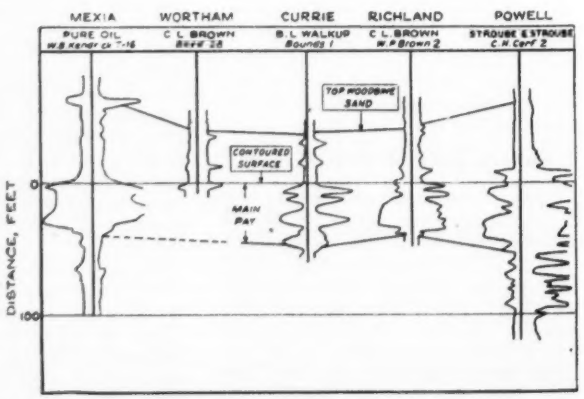

Fig. 1—Cross-section of fault-line fields correlated on top of main pay zone

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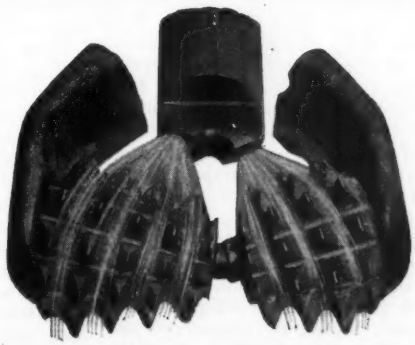

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(Continued from page 78)

only the data for the main Woodbine producing sandstone should be compared with similar data for the other fields."

The foregoing statement is substantiated by factual data. Reference to Fig. 3 of R.I. 3712 shows that 11 edge wells, beyond the limits of the main sand, and therefore, completed in only the upper stringers, are producing no water. This clearly indicates the absence of water drive. Tables 2 and 3 of the Hill and Guthrie report show the low recovery obtainable from these stringers. The 25 leases, which are entirely outside the limits of the main sand, obtained an average recovery of only 249 bbl. per acre-foot.

Hill and Guthrie used only the "fault leases" at Mexia for comparison with other fault-line fields. The fault-lease wells produced from the two upper stringers of poorer sand as well as from the main sand, and the sand volume used for the fault leases contained the sand in the two upper stringers. A lower than normal recovery per acre-foot from "main" Woodbine sand would, therefore, be calculated. Following the guidance of Hill and Guthrie as quoted hereinbefore, a correction for both sand thickness of and oil produced by the upper sands should be made on the fault leases to approximate the values for the "main Woodbine producing sands zone."

It is indicated that liberal net sand thicknesses for the main zone have been used by Hill and Guthrie. Attention is directed to the character of the zone as shown on Fig. 1. It consists of a main sand approximately 40 ft. thick which contains some shale breaks, followed by a shale section of some 20 ft., then sand stringers and shale to the base of the section. Particular reference is made to the electric log of Pure Oil Co.'s T-16 Kendrick well, which is located in the center of the lease and structurally high (tract A-15, well "C," Fig. 3, of R.I. 3712). A reasonable interpretation of this log would indicate 8 ft. of sand and 5 ft. of shaly sand or sandy shale in the two upper stringers, 38 ft. of main sand section of which the bottom 3 ft. are shaly sand, followed by 28 ft. of sandy shale, and shale with 4 ft. of sand in a stringer at the base of the section. A total of some 55 ft. of sand, or 42 ft. for the main zone, would be considered optimistic. Reference to Table 4 of the Hill and Guthrie report shows that an average thickness of 74 ft. was assigned to the lease on which this well is located, presumably on the basis of drillers' logs, of which 61 ft. would be attributed to the main zone. The total sand shown by the electric log is only 74 per cent of the average thickness stated by Hill and Guthrie for the lease and, for the main zone, approximately 69 per cent. The log for Peyton Bros. 1 W. M. Harris well (well "A," Fig. 3 of R.I. 3712), which is 1,800 ft. west of tract A-15, may be similarly interpreted.

Furthermore, the amount deducted for shale in the main zone by Hill and Guthrie appears to be low. Fig. 3 of R.I. 3712 shows contours on top of the main pay. The water level and limiting contour was estimated at an elevation of 2,550 ft. below sea level. Also, a limit for the upper stringers was estimated which enclosed a total of 3,798 acres (Table 6—R.I. 3712). The contour map has been planimetered to determine the gross volume of Woodbine between the contoured surface and water. The area of 3,798 acres was used to derive the acreage constant for the planimeter. The results showed there are 123,500 acre-ft. in the gross volume, and that 2,760 acres were originally productive. Hill and Guthrie calculated that there were 152,000 acre-ft. of net sand in all zones. The two upper stringers must have contained 45,500 acre-ft. (12 ft. by 3,798 acres), leaving 106,500 acre-ft. of net sand in the main zone. It is thus indicated that Hill and Guthrie estimated the zone to contain only 17,000 acre-ft. of shale, or 13.8 per cent. By using the sand thicknesses shown in the generalized section and the structure map, it can be shown that the shale percentage should approximate 25 per cent. Further, the thickness of 58 ft. of sand for the main zone, shown by the generalized section, may be excessive, based on interpretation of the two detail electric logs as discussed previously herein. Therefore, the shale percentage in the main zone probably is even higher than 25 per cent.

It is here estimated that the main zone contained not more than 92,600 acre-ft. of net sand (75 per cent of 123,500). The two upper stringers amounted to 45,500 acre-ft., giving a total of 138,100 acre-ft. for the field.

The recovery from the upper stringers may be approximately at 9,100,000 bbl. by multiplying the estimated recovery of 200 bbl. per acre-foot by the sand volume. The ultimate recovery from the field will be 102,647,000 bbl. of which 9,100,000 bbl. should be attributed to the upper sands and 93,547,000 bbl. to the main sand. This latter figure is equivalent to 1,010 bbl. per acre-foot from the 92,600 acre-ft. of main sand estimated previously herein, and compares with 864 bbl. per acre-foot estimated by Hill and Guthrie for the fault leases, and used by Clark, Tomlinson, and Royds as main sand values for comparative purposes. These estimates are summarized in Table 1.

It is not possible to determine the average spacing for the main sand from the data of Hill and Guthrie, as completion data for all wells are not given. It was, however, greater than the spacing of 4.7 acres per well for the fault-line leases.

Wortham Field

The Wortham field was discovered November 23, 1924, and development was at such a rapid rate and per-well producing rates were so high that 38 days later it had produced 888,856 bbl. of oil, an average of 23,390 bbl. per day. Initial production rates in excess of 1,000 bbl. per day were common, some wells producing as much as 9,000 bbl. per day. By the end of 1925, the cumulative production amounted to 16,859,981 bbl., or 72 per cent of the field's estimated ultimate recovery.

Hill and Guthrie estimate that the average ultimate recovery per acre-foot amounts to 1,245 bbl. This recovery appears to be high for the main sand for two reasons: (a) none of the recovery has been attributed to the upper sand stringers which have been proved productive; and (b) the original water level was estimated too high for most of the field, probably because of water coning induced by the high rates of production.

Two thin sands approximately 40 and 20 ft. above the main sand were logged in many wells, and are shown in the generalized section. Hill and Guthrie state: "Little consideration was given these two strata when the field was first developed," although in the majority of the wells shown in the cross-sections (Figs. 10 and 11, R.I. 3712) of their report casing was set above these sands so that they were open to the well bore.

There have been 24 wells drilled since 1940, generally along the axis of the structure. In an area of approximately 100 acres, 11 of these wells have been completed in the upper sands only. Their production ranges from 17 to 121 bbl. of oil per day. All produce from 60 to 96 per cent water, showing that also in the upper sands a water drive is present. The character of the sand is further indicated by one core analysis[8] which showed 28 per cent porosity and 1,620 md. permeability. This one porosity from an upper thin sandstone is used by Hill and Guthrie to calculate percentage recoveries which were in turn presented by Clark, Tomlinson, and Royds.

Hill and Guthrie suggest that these sands originally may have been productive also on the flanks of the structure by the following statement:

TABLE 1—RECOVERY ESTIMATES—MEXIA FIELD

	Upper sands	Main zone	Hill and Guthrie fault leases
Acre-feet of sand	45,500	92,600	103,543
Recovery, barrels	9,100,000	93,547,000	89,500,000
Unit recovery, barrels per acre-foot	200	1,010	864
Spacing, acres per well	.....	.....	4.7

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1. Feed Preparation Unit.
   Capacity consistent with alkylate production capacity.
2. Sulfuric Acid Alkylation Unit.
   1,200 barrels of aviation alkylate per day.

Storage tankage: Atmospheric: 55,000 barrels.
Plant site is served by Kansas City Southern Railroad.

•

Texas City, Texas (Plancor 1871)
Pan American Refining Corp.

A pentane isomerization unit with a rated capacity of 2,540 barrels of isopentane per day. Accessory facilities include a boiler plant and three buildings with a total floor area of approx. 5,800 sq. ft. Area of site approx. 7.27 acres, leased.
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Pressure: 60,000 bbls.
Texas City Terminal R. R. Co. has spur track on site.

•

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2. HF Alkylation Unit. 2,200 barrels of aviation alkylate per day.
3. U.O.P. Isomerization Unit. 250 barrels of isobutane per day.

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Pressure: 27,000 bbls.
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491-T

"Drilling records and cross-sections suggest (with the possible exception in an area developed by a few wells on the extreme eastern flank of the field) that the upper 50 to 60 ft. of the Woodbine formation in the Wortham field consists largely of broken sand and shale." It is presumed the eastern flank area referred to centers around tracts 1, 19, 20, 21, and 82, where the wells lie very near or beyond the productive limit (Fig. 9—R.I. 3712) for the main sand.

It is not possible with the data available to compute the recovery attributable to the upper sands. Because of their high permeability and the presence of water drive, the unit (per acre-foot) recovery should be large. The original productive area is unknown, and the total recovery, therefore, cannot be estimated. It is evident, however, that the calculated unit recovery for the main sand should be corrected for the contribution of the upper sands.

In Figs. 10 and 11 of the Hill and Guthrie report are data for all wells which were completed to produce from sand below an elevation of 2,540 ft. below sea level, and with test information. Water levels shown on the sections were as follows (depths in feet below sea level): A—2,560; B—2,555; C, D, and E—2,550.

The use of different levels for various parts of the reservoir is indicative of the difficulty in locating the water table. Because of the high withdrawal rates during the development period, water coned into many wells. This caused the water level to be located too high. Such appears to be the case for wells 5, 6, and 7 of Section D'-D, for which the initial rates were very high. On the same section is well No. 10, completed from 2,547 to 2,555 ft. below sea level, which produced only 9 per cent water and sediment on February 20, 1925. From the data given on the Hill and Guthrie report, there is not sufficient justification for locating the water at higher than 2,555 ft. below sea level in any part of the reservoir.

If, in the central part of the field, the original position of the water table is placed at 2,555 ft. below sea level, 3900 of gross acre-feet are added to the reservoir volume. Assuming that 50 per cent of this volume is shale, 1,950 acre-ft. of net sand are added to 18,868 acre-ft., making a total volume of 20,818 acre-ft., so that the ultimate recovery of 23,500,000 bbl. now is equivalent to 1,129 bbl. per acre-foot. If correction is made for recovery from the upper sands, it is doubtful that unit recovery from the main sand will exceed 1,100 bbl., rather than 1,245 bbl. per acre-foot for a spacing of 2.1 acres per well (which also includes wells completed in the upper sands only) estimated by Hill and Guthrie. The higher recovery for Wortham, as compared with Mexia and Powell,

should be attributed to the better average quality of the main zone (Fig. 1) rather than to differences in spacing.

Currie Field

Hill and Guthrie attribute the lowest recovery of all the fault-line fields, 770 bbl. per acre-foot, to Currie. This low recovery is attributable in large part to the fact that a recognized gas cap was included when calculating the acre-feet of oil sand. Clark, Tomlinson, and Royds accept the low recovery as being due to the relatively large spacing of one well per 5.8 acres.

The generalized section for the Currie field shows a gas zone to a depth of 2,520 ft. below sea level, just above a 3-ft. shale break. This gas zone was recognized early in the life of the field. The discovery well is reported producing a large volume of gas (top of sand, 2,540 ft. below sea level) in December 1921, 2 months after completion. The second well was completed in 1922. The record is not clear whether the well was a 4,000,000-cu. ft. gasser on March 12, 1922, and blew into oil to the amount of 500 bbl. on March 23, 1922, or whether the well was originally completed at a very high gas-oil ratio. It seems evident that a sizable gas cap or gas sand was encountered in the main Woodbine pay sand.

Tabulated hereinafter are wells which were shown in Figs. 15 and 16 of R.I. 3712 as logging the gas sand. An average gas-oil contact of 2,522 ft. below sea level is indicated:

Operator and well—	Gas-oil contact (feet below sea level)
Newblock 1 Bounds	2,527
Homaokla 3 McGaw	2,523
J. K. Hughes 2 McGaw	2,517
J. K. Hughes 3 McGaw	2,521
Average	2,522

The volume of sand above 2,520 ft. below sea level is estimated at 977 acre-ft. by Hill and Guthrie. The foregoing tabulation indicates that this is the minimum volume of the gas cap.

Total volume of Woodbine main zone originally above water was estimated at 9,908 acre-ft. Correction must be made for the two shale breaks of 3 ft. each. These would intercept the water level of 2,550 ft. below sea level at lines corresponding to the 2,540 and 2,527 ft. below sea-level contours, respectively, if they are assumed to lie at a uniform distance below the top of the contoured surface. The volumes would, therefore, approximate 3 by 350 or 1,050, and 3 by 250 or 750 acre-ft., a total of 1,800 ft., and compares with 1,236 acre-ft. estimated by Hill and Guthrie.

A further correction should be made for the shale at the base of the section. However, there is some evidence (Figs. 15 and 16, R.I. 3712) that the water level may have been placed too high by Hill and Guthrie. The deduction for shale would be offset by a slight lowering of the water table and is, therefore, neglected.

Within the main sand productive area, four dry holes were drilled, two of which were Morrow sand tests (Fig. 14, R.I. 3712), No logs or other data for these wells are available and, therefore, it cannot be determined if the dry holes were due to erratic sand conditions. If this were the case, deductions in the acre-feet of productive sand given for the field should be made.

Lease symbol	Recovery (barrels)	Proved area (acres)	Net sand thickness (acre-feet)	Producing formation (acre-feet)	Recovery (barrels per acre-foot)
B	46,120	3.28	6.7	22.0	2,096
D	79,057	3.87	10.2	39.5	2,001
F	100,969	2.89	6.4	18.5	5,458
O	57,760	2.66	4.0	10.6	5,449
P	16,893	1.28	5.0	6.4	2,640
Total field	6,500,000	234.06	20.1	4,701.4	1,361

To summarize, a total oil-sand volume of 7,131 acre-ft. is obtained by subtracting 977 acre-ft. for the gas cap and 1,800 ft. for the shale zones from 9,908 acre-ft. of main zone of the Woodbine at Currie obtained by Hill and Guthrie. In addition, there were 420 acre-ft. of productive Morrow sand, or a total of 7,551 acre-ft. for the field.

The estimated ultimate production of 7,000,000 bbl. is equivalent to 927 bbl. per acre-foot. This compares with 770 bbl. per acre-foot estimated by Hill and Guthrie. Because of the presence of the large initial gas cap, the corrected Currie unit recovery is lower than that at Wortham, which has a similar sand section. The gas was rapidly dissipated, and the oil moved into the gas zone under the action of the water drive. A portion of this migratory oil is not recoverable, and a lower unit recovery, therefore, results.

Richland Field

The Richland field, the smallest in areal extent of the five fault-line fields, obtained the highest unit recovery, or 1,383 bbl. per acre-foot, according to Hill and Guthrie. This estimate of recovery is considered excessive, because the reservoir water table was placed at too high a level.

Reference to Fig. 19 of R.I. 3712 shows the productive limit of the field as defined by the intercept of the top of the main sand with water at 2,610 ft. below sea level. It is noted that seven wells, which are shown to have been initially completed as producers, lie on or beyond this limit. The cross-sections of Fig. 20 (R.I. 3712) show five wells completed at a total depth below water. These facts show that the original water level probably was below 2,610 ft. below sea level.

The high recoveries obtained by edge leases is another indication that the water level was lower than 2,610 ft. below sea level. Some of these edge leases are tabulated as follows (from Table 17 of R.I. 3712):

Lease symbol	Recovery (barrels)	Proved area (acres)	Net sand thickness (acre-feet)	Producing formation (acre-feet)	Recovery (barrels per acre-foot)
B	46,120	4.25	9.6	40.8	1,130
D	79,057	4.91	12.5	61.4	1,288
F	100,969	5.45	7.2	39.2	2,576
O	57,760	4.39	6.4	28.1	2,056
P	16,893	2.32	6.6	15.3	1,104
Total field	6,500,000	259.3	22.9	5933.	1,096

These recoveries are exceedingly high for edge leases in a water-drive field. Estimating the water level at 2,615 ft. below sea level (5 ft. lower) has approximately the following effect on the recovery data for the foregoing leases and the total field:

The values for recovery per acre-foot for the edge leases are more reasonable, although still higher than would be anticipated from experience obtained in any water-drive previously or subsequently developed. Reference to Fig. 19 (R.I. 3712) will show that lowering the water level to 2,615 ft. below sea level places all wells which were initially productive within the productive area.

A reduction from 1,383 bbl. to at least 1,096 bbl. per acre-foot recovery from the total field is fully justified, and makes the recovery from this field approximately the same as that for Wortham. However, it must be concluded that the data for this field are not sufficiently accurate to form the basis for a mathematical formula relating recovery to well spacing.

Powell Field

The Powell field is more complex in some features than the fields previously discussed. It has a greater productive closure (190 ft.), and there is present a "big pay" at the base of the section in wells which found the top of the main sand above approximately 2,435 ft. below sea level. The main sand zone is similar to the Mexia section, but has numerous sand stringers at the base and is, therefore,

better developed. The 12.5-per-cent shale figure given as the average for the Powell field looks low on the basis of the columnar section (Fig. 2, R.I. 3712), and the structure map. This is probably offset by not including the thin sand above the main sand in the total sand volume.

Use of a different water table in the north end of the field (2,610 ft. below sea level) indicates that a separate closure should be made around the area of the discovery well (Fig. 23, R.I. 3712).

The recovery for the Powell field, 939 bbl. per acre-foot, appears reasonable, and is comparable with the corrected estimated recovery from Mexia, which field has a similar sand section.

Summary—Faul[t]-Line Fields

Hill and Guthrie concluded their report with the following paragraphs:

"The relatively close spacing of wells in the Mexia-Powell fault-line fields, ranging from a maximum density of one well to 2.2 acres in the Wortham field to a minimum density of one well to 5.8 acres in the Currie field, is indicative of the conception held by many operators during the early 1920's that, to recover a high percentage of oil from reservoir sandstones, wells should be spaced closely. Today the fallacy of extremely close spacing of wells, both from the economic and recovery viewpoints, is widely accepted, and many engineers and operators now are of the opinion that ultimate recovery in the fault-line fields was not increased measurably by drilling a large number of wells, and that about as much oil would have been recovered at a considerably lower cost of development and operation if fewer wells had been drilled in the fault-line fields.

"Obviously, an oil field cannot be developed and exploited twice—once closely spaced and again with the wells spaced farther apart—to determine which method of development will yield best results. It is appreciated, also, that no two fields are alike in all their reservoir characteristics, regardless of their geographical proximity or how closely they seem to resemble one another in all measurable properties."

A critical examination of the data presented in R.I. 3712 indicates that the fault-line fields produced between 900 and 1,100 bbl. per acre-foot from the main Woodbine sand. There is considerable doubt as to the accuracy of the recovery figures because the sand volumes are not precisely known. The lack of any core data, except in an upper sand at Wortham, allows no reasonably accurate estimation of percentage recoveries.

Table 2 summarizes the recoveries estimated herein for each of the fields, and shows also the approximate surface spacing as given by Hill and Guthrie. There appears to be no relation between recoveries and approximate spacings.

TABLE 2—RECOVERIES—FAULT-LINE FIELDS

Field	Ultimate production (barrels)	Sand (acre-feet)	Recovery (barrels per acre-foot)	Spacing (acres per well)
Mexia*	93,547,000	92,600	1,010	4.7
Wortham	23,500,000	20,818	1,100†	2.1
Currie	7,000,000	7,551	927	5.8
Richland	6,500,000	5,933	1,096	2.4
Powell	113,500,000	120,813	939	3.5

*Main Woodbine sand only. †Includes an approximate correction for recovery from upper sands.

Intrafield Data

Clark, Tomlinson, and Royds conclude from their review of the data for the fault-line fields: "The conclusive demonstration furnished by these data from separate fields, that well spacing, even with densities below 6 acres per well, does affect recoveries in accordance with a definite mathematical relationship, makes a huge volume of supporting evidence based on different spacings in the same field admissible."

The pitfalls of such logic are obvious, and have been adequately discussed by Muskat.[4] Further, an analysis by Muskat of the spacing problem in dissolved-gas-driven fields shows that the ultimate recovery should not materially depend on the number of wells drilled. Although application of the numerical results of the investigation cannot be made, the conclusions drawn are believed to be qualitatively significant. The line of reasoning shows that proper well density is mainly determined by economics of producing sufficient oil to meet demand and to yield a maximum ultimate earning.

In our opinion the data from the Texas fault-line fields referred to is not conclusive, and certainly the subsurface data available on these old fields are not sufficiently accurate for mathematical analysis of the type presented by Clark, Tomlinson, and Royds for interfield studies. Therefore, their conclusion that these interfield data allow the use of intrafield data as supporting evidence is open to question.

The intrafield data given by Clark et al are reviewed in part in the following to show the lack of mathematical relationship proposed by Clark, Tomlinson, and Royds.

Lucien Field

The Lucien field in Noble County, Oklahoma, may be considered as consisting of two parts: the main structure which was developed with a spacing of 40 acres per well under unitized operation, and a south extension largely developed on a 10-acre, spacing pattern.[4] Both areas produce from the First and Second "Wilcox" sands. Production from the First and Second was not segregated by Clark et al.

Whereas Clark, Tomlinson, and Royds state that the two sands are "practically identical in character," reservoir pressure and other data indicate they are not. As of July 1939, pressures measured in the Second Wilcox were 1,200 psi., compared with 200 psi. in the First. In the north (unitized) end of the field, Second Wilcox wells currently have a producing capacity which is on the average four times greater than those of the First Wilcox.

It has not been possible to define the portions of the Wilcox section which are productive. Only total sand thicknesses, not "pay" thicknesses, are available. Considered on the gross-thickness basis, however, recoveries in the unitized area as of January 1, 1943, (the date of the Clark et al estimate) were 88 bbl. per acre-foot from the First, and 161 bbl. per acre-foot from the Second.

The average thickness of the First Wilcox in the area of 40-acre spacing is 45 ft., compared with 25 ft. in the area of 10-acre spacing. The failure of Clark, Tomlinson, and Royds to separate the two horizons results in averaging into the one area twice the amount of poor quality First Wilcox than in the other. No comparison of the relative recoveries for 40-acre and 10-acre spacing is possible on this basis.

Healdton Field

Data for the Ideal Oil & Gas Co. Scroggins lease (approximately 26 acres) of the Healdton field are presented by Clark, Tomlinson, and Royds to show that additional drilling late in the productive life of the lease (infill drilling) resulted in an increase in recovery which was in accordance with the square-root rule. It is of interest to note that the northern productive limit of this lease has never been defined by drilling, and the actual acreage being drained is unknown.

A more complete and detailed analysis of the results of infill drilling and other influences in this field has been made, and a summary of these results is given in Table 3 and Fig. 2. This summary presents an analysis of 15 leases in this pool—which comprise 1,455 acres. Separate decline curves were prepared for each lease, and these separate decline curves were then added to give the composite result shown. The net result of this analysis shows that an additional 1,520,000 bbl. of oil have been recovered. This oil is the result not

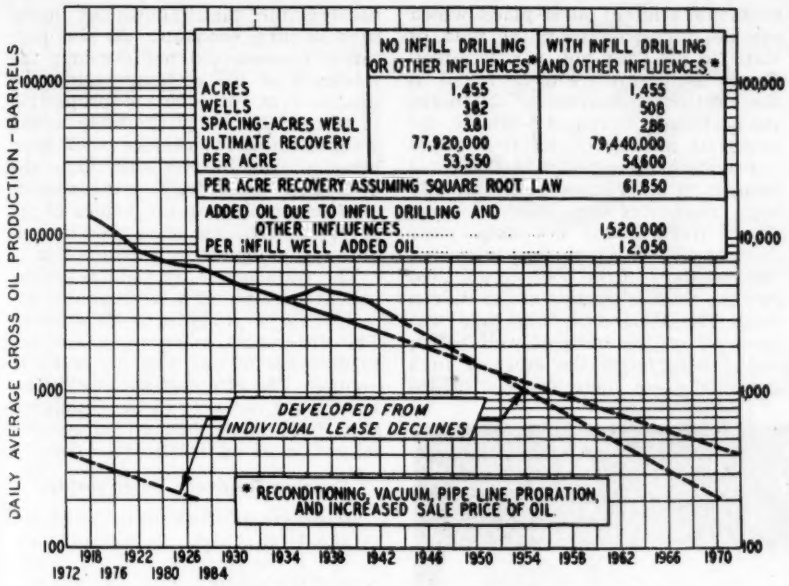

NO INFILL DRILLING OR OTHER INFLUENCES*
WITH INFILL DRILLING AND OTHER INFLUENCES *
ACRES 1,455 1,455
WELLS 382 508
SPACING-ACRES WELL 3.81 2.86
ULTIMATE RECOVERY 77,920,000 79,440,000
PER ACRE 53,550 54,600
PER ACRE RECOVERY ASSUMING SQUARE ROOT LAW 61,850
ADDED OIL DUE TO INFILL DRILLING AND OTHER INFLUENCES 1,520,000
PER INFILL WELL ADDED OIL 12,050
DAILY AVERAGE GROSS OIL PRODUCTION - BARRELS
100,000
10,000
1,000
100
DEVELOPED FROM INDIVIDUAL LEASE DECLINES
* RECONDITIONING, VACUUM, PIPE LINE, PRORATION, AND INCREASED SALE PRICE OF OIL
1918 1922 1926 1930 1934 1938 1942 1946 1950 1954 1958 1962 1966 1970
1972 1976 1980 1984

Fig. 2—Influence of infill drilling—15 leases in the Healdton pool

only of infill drilling, but also because of the reconditioning of wells, which was stimulated by an increase in the sale price of oil, repressuring and the extensive application of vacuum. All these went into effect at about the same time, and all have made some definite contribution to the results noted. On the basis of the added wells drilled, this recovery amounts to but 12,000 bbl. per infill well. It is to be noted that the added recovery falls far short of the expectancy of 94,700 bbl. per well based on the square-root rule, even if all of the additional oil is credited to infill drilling. When it is considered that this added oil must be divided among all the effects set out previously herein, it is clear that the contribution of the infill drilling alone was indeed small, and something less than attractive financially.

The geology of Healdton is complicated, and the sands are lenticular. Strictly speaking, each reservoir should be analyzed separately to prevent confusion caused by broad application of the term "spacing." Results of infill drilling in some isolated areas were better than average due to the tapping of productive lenses not previously penetrated. However, risks must be based on average conditions, which at Healdton indicate that infill drilling alone results in economic loss.

Oklahoma City Field

The Oklahoma City field is notorious for the large volumes of oil which have migrated from one area to another. At least 50,000,000 bbl. migrated from the Mansion area, prior to its development, into the portion of the field to the south. Movement of water into the reservoir from the west moved oil from under downdip acreage. Gravity drainage has been responsible for extensive downdip movement of oil. Recovery by a given well was primarily dependent on the allowable permitted the well. During the period of proration, allowables were based on potentials, which were often magnified by various artificial lifts in large-size casings, factors other than well spacing, and pay thickness; and densely drilled areas wantonly drained areas less densely drilled.

The Mansion area was developed during and after 1935. The first production from elsewhere in the Wilcox was in March 1930, and by January 1935 the average reservoir pressure had declined from the original 2,686 to 430 psia. An estimate by Katz[5] indicates that 86,000,000 bbl. of oil have migrated from the Mansion area because of earlier development of, and high rate of, production from other areas.

The average quality of the Wilcox sand varies both vertically and laterally. The top 40 ft. or so of the section is of poorer quality than that below. This is shown by core analyses in Table 7 of the Katz paper, and by the following excerpt from a statement referring to this upper sand: . . . "more nearly represents the 'tight' sand of stratum 'A' in Fig. 7 than the 'loose' sand of stratum 'B' in the reservoir." The Fig. 7 referred to shows the division of the Wilcox into strata, and further demonstrates the better quality of "B" by showing that the encroachment of edge water was more rapid than in "A." The poorer quality of "A" results in the downdip (west edge) leases having a section of inferior quality compared with those updip.

The part of the field south of 22-11-3 (Fig. 3) contains sand of poorer quality than the main body of the reservoir. This fact is borne out by the observation that the ultimate recovery per well in this area is only 440,000 bbl. per well, compared with 660,000 bbl. per well in the more densely drilled area to the north, although the sand thicknesses are approximately equal. In addition, considerable gas was encountered in some of the Wilcox in the southern end. This gas limited the space occupied by oil.

The map (Fig. 3) is taken from the Clark et al paper. The values established for recovery with wide spacing are wholly dominated by the shaded area south of 22-11-3, and the acre-

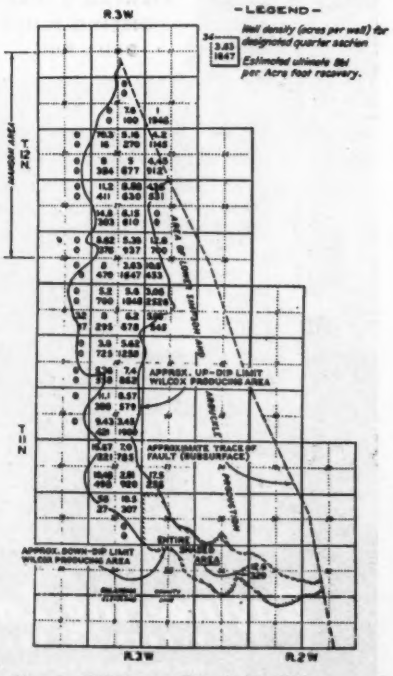


Fig. 3—Oklahoma City field—Wilcox sand zone

TABLE 3—RECOVERY ESTIMATES FOR 15 LEASES—HEALDTON FIELD

	Prior to infill drilling	After infill drilling
Productive acres	1,455	1,455
Number of wells	382	508
Spacing, acres per well	3.81	2.86
Ultimate recovery:		
Barrels (estimated)	77,920,000	79,440,000
Calculated by square-root rule	.....	89,840,000
Increased recovery:		
Barrels (estimated)	.. ..	1,520,000
Calculated by square-root rule	.....	11,920,000
Increase per infill well (estimated)	.....	12,050
Calculated by square-root rule	.....	94,700

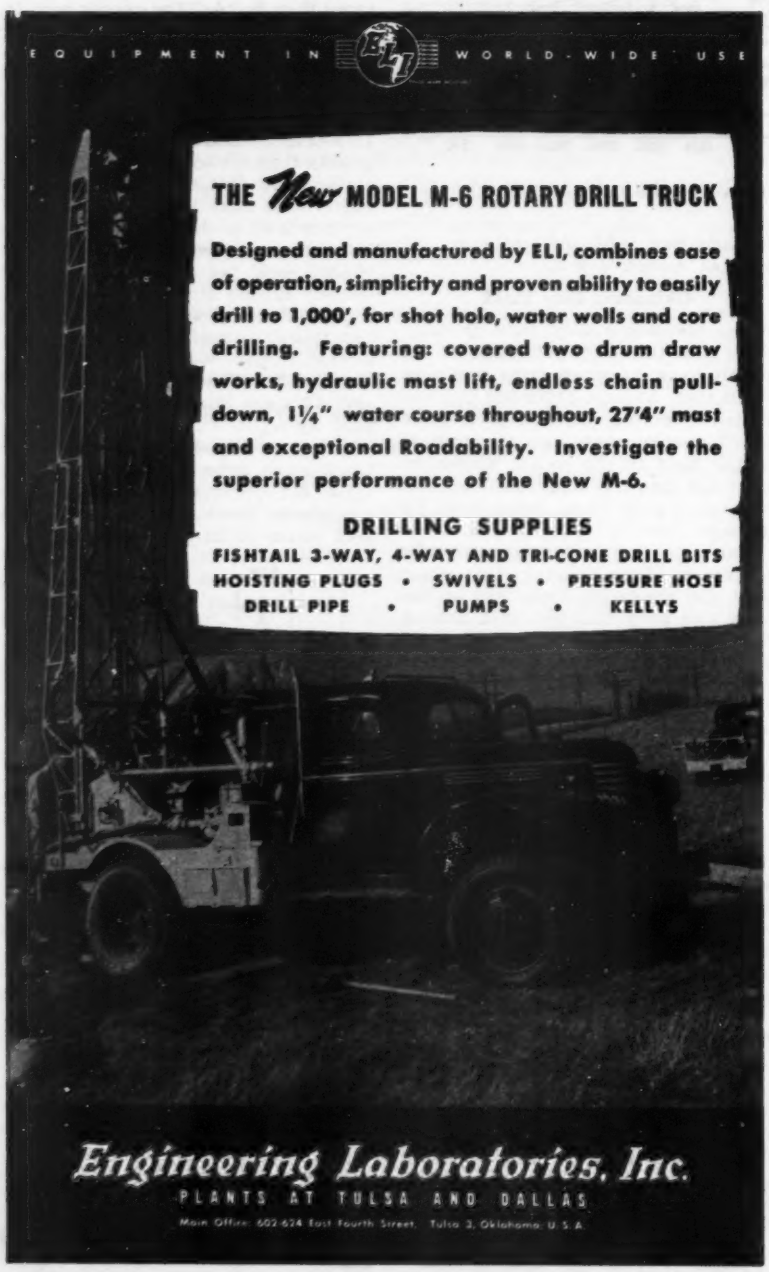
age along the west edge of the field. It has been pointed out that the sand in these areas is of unquestionably poorer quality than in the remainder of the field. Furthermore, it is significant that about 20 per cent of the reservoir volume of the Wilcox sand was invaded by water encroaching from the west, and this movement was more pronounced in the northern part of the field. This water encroachment discouraged drilling along the west edge, and moved oil to structurally higher, more densely drilled locations.

It is noted (Fig. 3) that certain quarter-sections have recovered from one and one-half to more than two times the original oil in place, which can be calculated from the data of Katz[9] to be 1,200 bbl. per acre-foot. Examples of this are to be found in the northwest quarter of 2-11n-3w, the northeast quarter of 3-11n-3w, the southeast quarter of 15-11n-3w, and the southeast quarter of 34-12n-3w; a number of other cases of abnormally high recoveries can also be seen. These tracts were not only more densely drilled, but those tracts along the east flank of the pool were drilled into the thinnest section of the Wilcox sand. The Oklahoma City field was prorated on the basis of well potential. Furthermore, the areas of high potential were more densely drilled because the high allowables made such drilling economic. As the proration formula did not consider the thickness of the section, wells were produced at rates out of proportion to recoverable oil attributable to the well, resulting in drainage of oil from other tracts. Despite this fact, the data from these tracts were considered in establishing the values of recovery and spacing to be used in support of the square-root assumption.

The Oklahoma City field is an excellent example of a field wholly unsuited for a study of well spacing. The differences in recovery are due to drainage of one area by wells in another. The effect of spacing differences upon recovery in the Oklahoma City field is masked by large-scale migration of oil in the reservoir.

Spacing-Recovery Relationships

According to Cutler's rule and the proposal of Clark, Tomlinson, and Royds, if the reciprocal of the square root of the spacing expressed as acres per well is plotted on one coordinate and the unit recovery in barrels per acre-foot on the other, a straight line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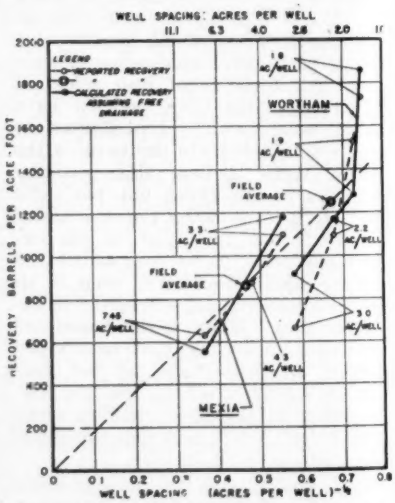

Fig. 4—Relation between well spacing and oil recovery—Mexia and Wortham fields

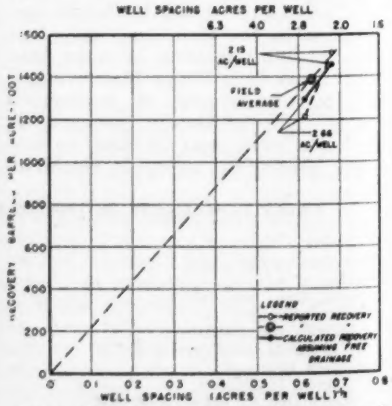

Fig. 5—Relation between well spacing and oil recovery—Richland field

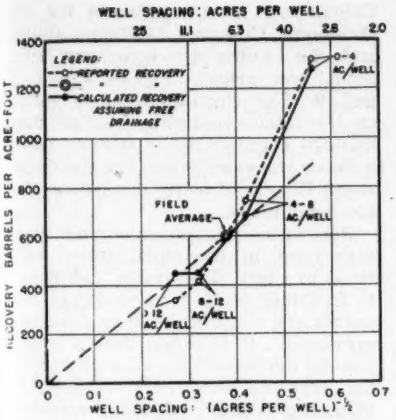

Fig. 6—Relation between well spacing and oil recovery—Oklahoma City field (Total Wilcox zone)

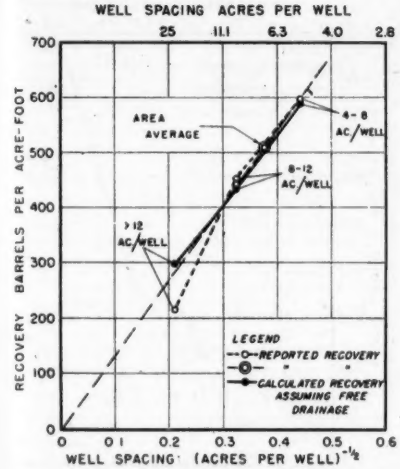

Fig. 7—Relation between well spacing and oil recovery—Oklahoma City field (Mansion area)

from the origin can be drawn through the points. In this manner, the graphs of Figs. 3, 4, 7, and 8 of the Clark et al paper were constructed. Deviation of the points from the straight-line curves were discussed, and it was pointed out that the deviations were toward a steeper slope, indicating that "the more widely spaced (wells were) . . . penalized to a greater degree than would be expected." Comparison of graphs for the Oklahoma City field with those for the fault-line fields indicated that proration tends to "aggravate that effect." No explanation is given for the fact that some of the densest drilled areas show recoveries greater than the amount of oil that could possibly have been present in the pore space.

If a free drainage condition in the reservoir is assumed, so that each well is completed simultaneously and produces the same amount of oil, a theoretical recovery per acre-foot from areas of different spacing can be calculated, based on a knowledge of the total recovery from all wells.

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TABLE 4—OKLAHOMA CITY FIELD—TOTAL WILCOX ZONE

Spacing, acres per well—	0-4	4-8	8-12	Over 12	Miscellaneous and undrilled	Total
1. Number of wells	215	358	192	134	5	904
2. Effective acres	709	2,007	1,784	1,622	621	6,743
3. Acres per well (spacing)	3.3	5.6	10.4	13.1	.....	7.45
4. Acre-feet "pay"	93,983	295,180	240,934	166,586	39,512	836,195
5. Estimated ultimate recovery (1,000 bbl.)	123,490	221,191	102,845	53,868	.....	501,394
6. Observed recovery, barrels per acre-foot	1,314	749	427	324	.....	600
7. Average recovery, barrels per well	.....	.....	.....	.....	.....	554,600
8. Barrels per well times number of wells (1,000 bbl.)	119,245	198,558	106,489	74,320	.....	.....
9. Calculated recovery, barrels per acre-foot (free drainage assumed)	1,269	673	442	446	.....	600

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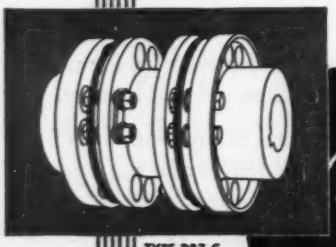

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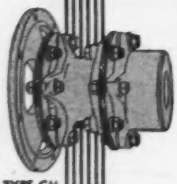

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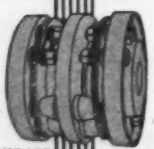

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Calculations have been made for the Oklahoma City and fault-line fields, and the results are compared with actual recoveries in Figs. 4, 5, 6, 7, 8, and 9. The calculated curve based on the square-root rule (straight line through origin) also is shown. Table 4 shows the calculations for the Oklahoma City field using the free-drainage assumption.

Recoveries per acre-foot and spacings used in the calculations were those of Clark, Tomlinson, and Royds to facilitate comparison, although the values are not acceptable as discussed previously. It is noted that a better general agreement between calculated and reported recovery is obtained by assuming equal per-well recovery than by use of the square-root rule.

It is concluded that the intrafield relationships between spacing and re-

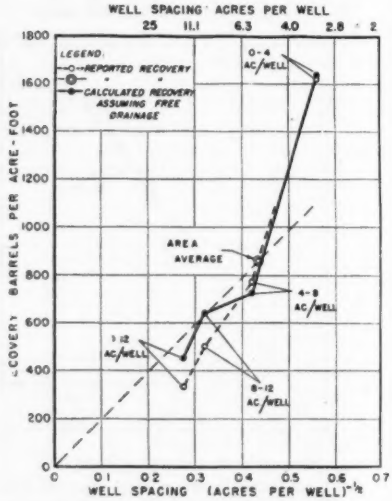

Fig. 8—Relation between well spacing and oil recovery—Oklahoma City field (Updip quarter-sections)

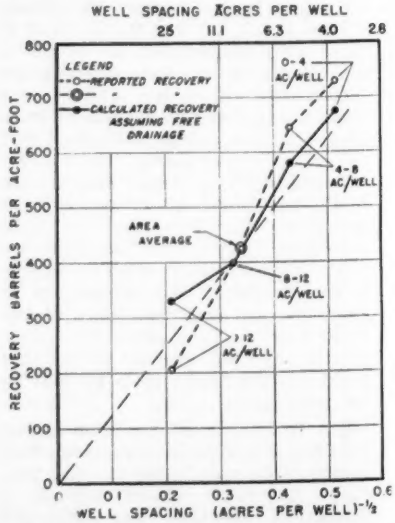

Fig. 9—Relation between well spacing and oil recovery—Oklahoma City field (Downdip quarter-sections)

covery presented by Clark, Tomlinson, and Royds are due to drainage of oil by densely drilled areas from those less densely drilled. The data are not pertinent to the spacing problem for a given field, but serve only to illustrate the inequitable recoveries which may result from the methods used to develop and produce some fields.

Conclusions

1. The unit recovery figures calculated by Hill and Guthrie for the fault-line fields are not based on accurate subsurface or reservoir information. When obvious corrections in the net sand volumes are made, it is indicated that recovery is practically independent of spacing. Therefore, the Clark, Tomlinson, and Royds formula, which depended in great part on this data, has no basis which would allow its acceptance.

2. Data for recoveries from areas within a reservoir (intrafield) should not be used to substantiate a formula proposed to relate total recovery from a reservoir to the spacing used to develop it.

3. Intrafield spacing-recovery relationships exist because of drainage from less densely drilled areas to those more densely drilled. In many cases an assumption of equal recovery per well enables a calculation of this drainage, which agrees more closely with fact than that calculated by the Cutler (square-root) rule.

Much progress has been made by the petroleum industry in the past decade toward an understanding of the principles governing reservoir performance, and in the intelligent application of these principles to the problem of "spacing." The industry should continue this progressive trend. Well locations (spacing) should be based on the best contemporary knowledge of reservoir behavior, and not on the basis of empirical formulas which were proposed at one time.

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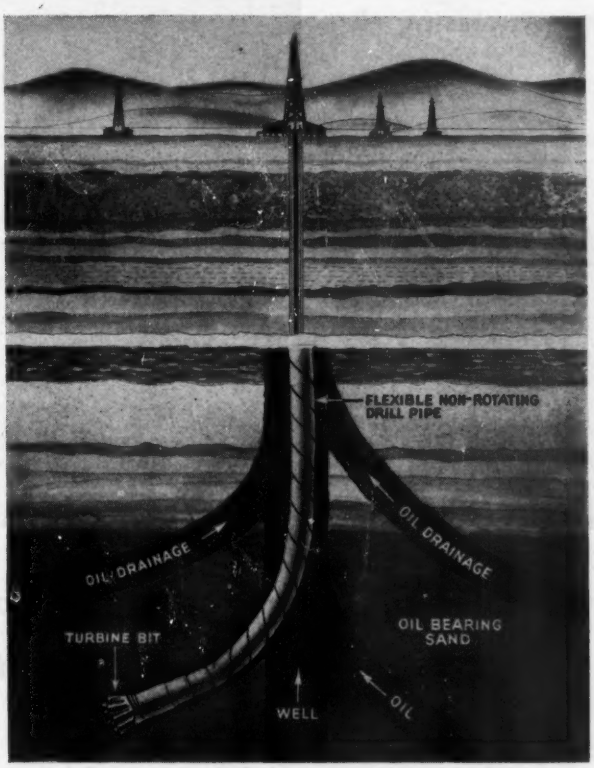

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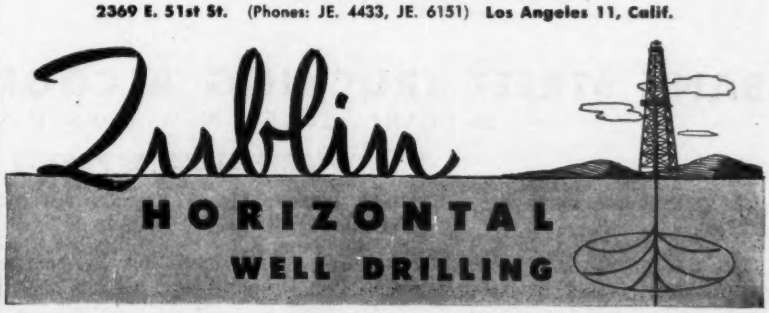

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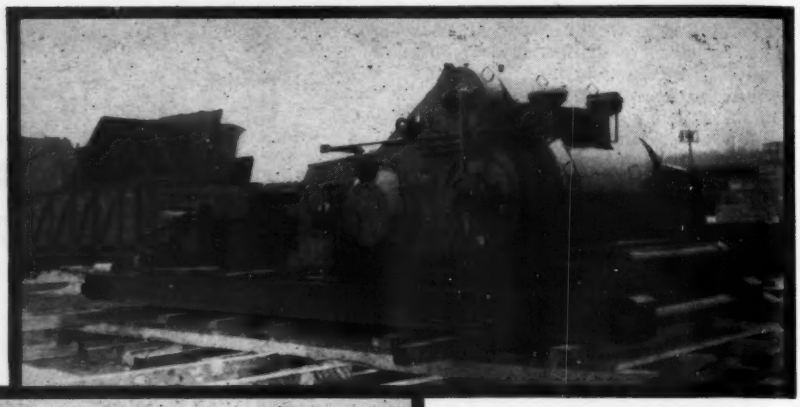

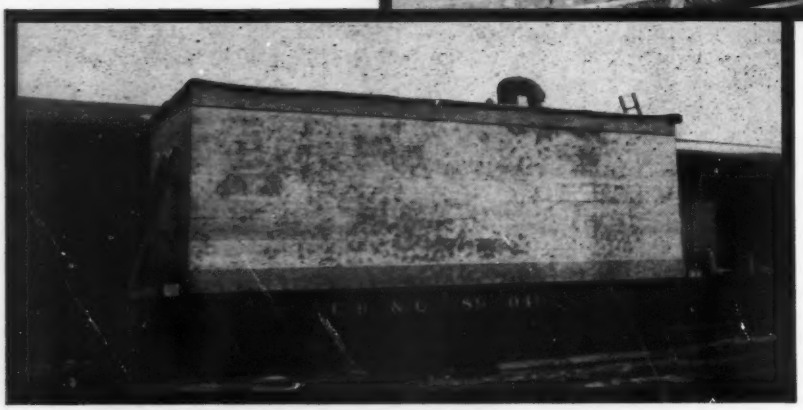

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Fouling Factors—Oil Products

THE Refiner's Notebook No. 94 (May 25, 1946, page 141) presented fouling factors for crude oil and for water. Table 1 on this page indicates miscellaneous fouling factors including those for steam and for gases, and Fig. 1 indicates factors that may be expected in petroleum distillation units, as a function of gravity.

TABLE 1—MISCELLANEOUS FOULING FACTORS

Steam (nonoil bearing)	0.5
Steam, exhaust (from reciprocating engines)	5.0
Air and natural gas	2.0-3.0
Refrigerating vapors (condensing from compressors)	2.0
Coke-oven and manufactured gases	10.0
Diesel-engine exhaust gases	10.0
Refrigerating liquids, brine, etc.	1.0
Fuel oil	5.0
Solvents (treating or dewaxing)	1.0

Severe fouling.—Even larger fouling factors than those shown on this page or in Notebook No. 94 may be encountered. Severe corrosion, deposits of coke, salt, or soot, and extremely reactive stocks such as severely cracked stocks, may cause fouling factors more than twice as large as those shown.

In cooling wax-bearing stocks the temperature at the surface may be lower than the pour point of the stock even though the main body temperature of the waxy stock is quite high. In such a situation wax is deposited on the surface and the fouling factor may be 25 or larger.

A somewhat similar situation may arise with hard water. Calcium sulfate is most soluble at about 100° F. and at about 145° F. a rapid decrease in its solubility occurs. Thus if the film temperature of the hard water exceeds 145° F., scale will be produced which greatly increases the fouling factor. This accounts for the fact that water is seldom heated to temperatures exceeding about 120° F. particularly if the other fluid is very hot (produces a high temperature in the water film).

Example 1.—A desalted crude oil is being heated by gasoline vapor in a topping plant. The crude oil is heated to 190° F. and it flows at 4 ft. per second. According to Fig. 1 (Notebook No. 94) the fouling factor of the crude oil will be 1.8. The fouling factor for the gasoline (60 A.P.I.) according to Fig. 1 on this page will be about 1.5.

Example 2.—The gasoline condensate is cooled further by river water in a coil-in-box equipment. According to Fig. 1 the fouling factor for the gasoline will be about 1.2 (sidestream curve) and for the water, according to Fig. 2 of Notebook No. 94, will range from 6 to 10. The high value of 6-10 was selected because the convection currents would be slow in a box in which the vapor temperature is low.

TENTATIVE SCHEDULE OF TOPICS

No. 96—Over-all Transfer Rates
No. 97—Pressure Drop Through Tubes
No. 98—Pressure Drop—Shells
No. 99—Fin-Tube Exchangers

The temperature difference in exchangers has been discussed in the following Refiner's Notebooks:

No. 71—Dec. 8, 1945, p. 111, How Big An Exchanger?
No. 73—Dec. 22, 1945, p. 91, Temperature Difference in Exchangers
No. 75—Jan. 5, 1946, p. 85, Log Mean Temperature Difference
No. 77—Jan. 19, 1946, p. 99, Shell and Tube Passes

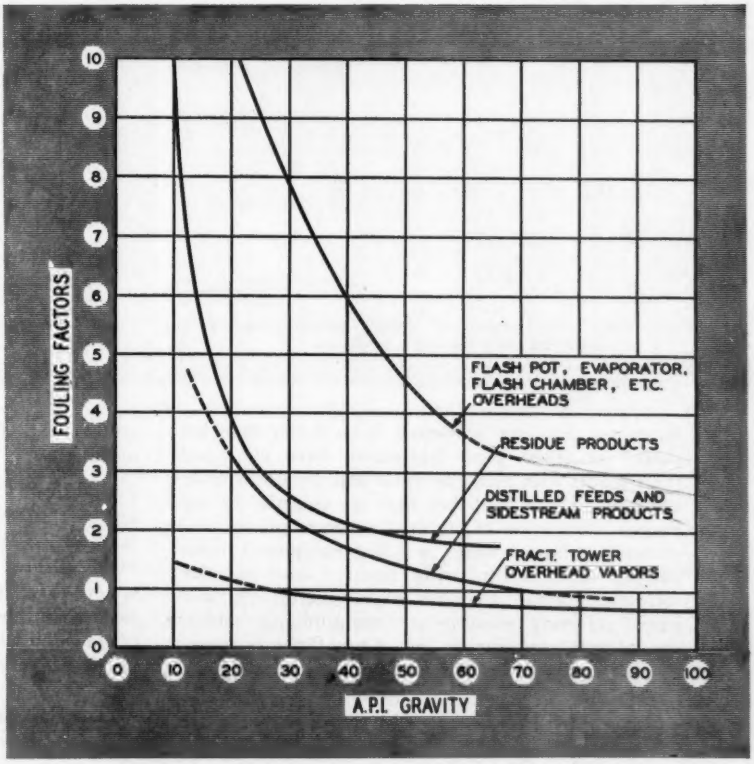


Fig. 1—Fouling factors of petroleum and natural-gas products. (Topping, vacuum rerun, treating, and cracking units)

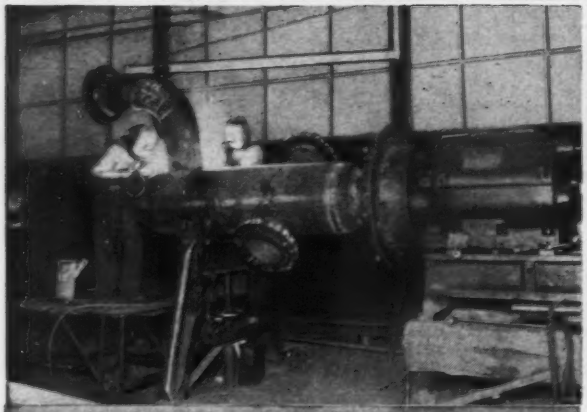
No. 95 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

Modern Pressure Piping Requires

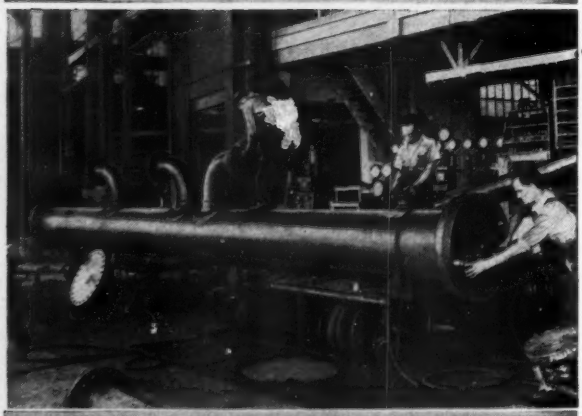
MODERN SHOP EQUIPMENT

Furnace for heat treating alloy piping and for stress relieving shop-welded subassemblies.

Modern machine tools are used by the qualified fabricator for the accurate facing of pre-fabricated piping.



Special work rotating equipment permits pressure welding under the most favorable conditions.



Adequate testing equipment is another important advantage of the qualified pipe fabricator.

Knowing that "the workman is no better than his tools," qualified pipe fabricators have equipped their plants with many facilities that are not usually available in the field, but that are essential to the proper fabrication of modern pressure piping. Included are layout tables, bending equipment, form cutting machines, rotating fixtures and jigs for welding, special machine tools, preheating and stress relieving equipment, straightening tables, special testing equipment, etc. These facilities represent an enormous investment and are necessary to assure the high quality, speed, economy and easy installation of pre-fabricated pressure piping.

Pre-fabricated piping is delivered to the job as a series of subassemblies with all difficult operations performed. These subassemblies are commercially practical, heat treated and stress relieved when necessary, shop tested, accurately aligned, thoroughly cleaned and inspected. Erection requires a minimum of time and labor . . . the finished job is better piping.

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A FEATURE OF THE OIL AND GAS JOURNAL

Surveying: Length of Lines

THE length of a line is the horizontal distance as measured, usually in feet, between the two verticals passing through the extremities of the line. The horizontal length is desired because all land measurements are generally reduced to a map which represents the horizontal projection of the area.

Tape not standard length.—Nearly all 100-ft. steel tapes may be assumed to be 100 ft. long under standard conditions. Standard conditions are met when the tape is fully supported, the temperature is 67° or 68° F. and the applied pull is 12 lb. The authors have checked many new 100-ft. tapes and the maximum variation ever discovered has been only 0.003 ft. Expressed as a ratio this is 1 part in 33,000.

Effect of tension.—Variations in pull do not change the length of a tape appreciably. An increase in pull of 10 or 12 lb. will not stretch the ordinary steel tape by more than 0.01 or 0.02 ft. In precise surveys the pull is controlled by using a spring balance.

Temperature change. — Temperature changes sometimes produce a measurable difference in the length of tapes. The linear coefficient of expansion of steel is 0.0000065 ft. per ft. per °F. A 40° change in temperature from standard will introduce an error of approximately 1 part in 4,000. Corrections for temperature changes are easy to make.

Errors due to sag and wind.—When a 100-ft. tape is supported only at the ends and the standard pull of 10 or 12 lb. is applied the tape will sag. This sag reduces the effective length of the tape and introduces errors into the measured length of the line just as though the tape was too short. A good way to realize the magnitude of such an error is to lay the tape out on a plane surface and with the standard pull applied mark the position of the two ends of the tape (Fig. 1). Then raise the tape with both ends at approximately equal distances above the plane surface. By the aid of a plumb bob the 100-ft. end of the tape is held so that it is vertically above the 100 mark placed on the plane surface. Then apply the standard pull and transfer the zero mark to the line below. It will fall at 0 ft., approximately 0.10 ft. from the previous marked zero point.

Wind, especially when blowing nearly at right angles to the direction in which measurements are taken, will produce the same effect as the weight of the tape, except in the horizontal direction. This requires a still harder pull.

Slope errors.—One of the greatest sources of error in the horizontal measurement of the lengths of lines is that caused by both ends of the tape not being held in the same horizontal plane (see Fig. 2). Let "s" represent the slope length, usually 100 ft. Let "a" equal the projection of "s" into a horizontal plane. Let "h" equal the vertical difference in height between the two ends of the tape. With "A" as a center and "s" as a radius an arc is swung until it intersects the horizontal line at C. AC is therefore equal to "s" and (s — a) is the error caused by not holding the tape horizontally. In the figure, ABD is a right triangle, hence:

$$s^2 - a^2 = h^2 \qquad (1)$$

$$(s - a)(s + a) = h^2 \qquad (2)$$

$$s - a = \frac{h^2}{s + a} \qquad (3)$$

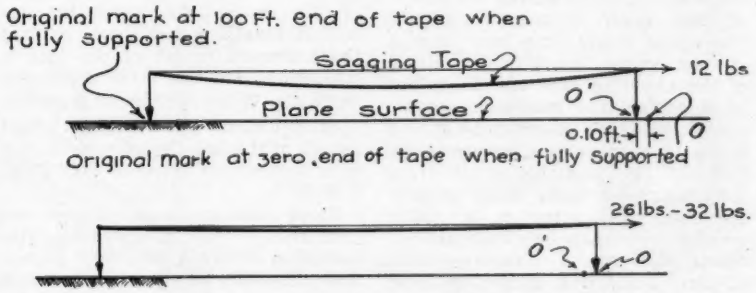
But, s — a = the error introduced.

Hence, error $= \dfrac{h^2}{s + a}$.

For even moderate values of "h," "s" and "a" are approximately equal so the error $= \dfrac{h^2}{2s}$, approx.

If "h" was known no error would be introduced into the measurement of distances, but in order to give an idea of the error which might occur let it be assumed that h = 3 ft. and s = 100 ft. The assumption of h = 3 ft. is very reasonable since most inexperienced chainmen tend to hold the downhill end of the tape too low by 2 or 3 ft., sometimes more. The error then is equal to 9 parts in 200. This simply means that under these conditions a horizontal distance of only 99.955 ft. is laid off but it is recorded as 100.00 ft. This is a ratio of precision of only 1 part in 2,200 which is hardly accurate enough for ordinary surveys. The error from this source can be eliminated by using a hand level to determine when both ends of the tape are in the same plane but this sacrifices speed for accuracy.

One of the best aids to help determine when a tape is held horizontally is to observe the interior angle formed by the tape and the plumb-bob string. Since all tapes will sag a little regardless of how hard they are pulled this angle must always be slightly less than 90°.



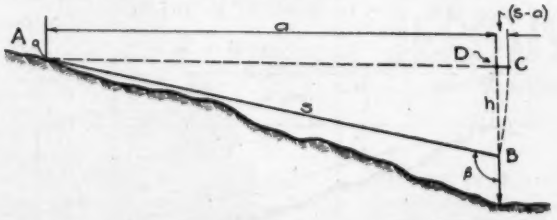


Fig. 1—(Above) Effect of sag on tapes supported at ends only (upper); and effect of sag eliminated by increase in pull (lower)

Fig. 2—(Left) Error caused by slope

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

Engineering Fundamentals (Continued)

Most inexperienced chainmen will hold the downhill end of the tape so low that the angle formed between the tape and the plumb bob is decidedly greater than 90° (Angle B, Fig. 2). The tape is held in the horizontal plane when the bob is advanced farthest along the line toward the distant point.

Tape not on line.—It is unnecessary to use a transit to keep chainmen on line when only the length of the line is desired. With reasonable care chainmen can keep themselves well enough on line by eye. This is particularly true if a range pipe is used for the forward point.

Tape not straight.—If the tape is not straight along the line that is being measured the same sort of error is made. This is caused by failure to give the tape a little "twitch" while tension is applied in order to make it lie straight between its two ends, or because the tape may be held away from its true line by weeds, twigs, or brush.

Systematic and accidental errors.—All of the errors discussed above are known as systematic errors. Some are constant and others are variable, but they combine to produce what is known as the resultant error in the measured length of a line. Under ordinary circumstances the resultant error might be appreciable but by increasing the care with which the measurements are made systematic errors can be largely eliminated and the resultant error reduced accordingly.

Accidental errors do not play a major role in determining the length of lines under ordinary conditions. There are really only two sources of such errors. One is in the setting of the chaining pins and the other in plumbing. The maximum magnitude from either source need not be large, perhaps seldom greater than 0.02 ft. The probable error from these sources is quite small because the individual error in a single measurement may be either plus or minus and have a minimum value of zero. Accidental errors are said to vary as the square root of the number of chances for the error to occur times the probable maximum value for the error.

To illustrate the effect of the two types of errors let it be supposed that a line is recorded as being 5,000 ft. long when measured with a 100-ft. steel tape which is 0.02 ft. too long. Let it also be assumed that on the average it was necessary to use the bob every 100 ft. and that the maximum error in plumbing was ±0.02 ft. The constant systematic error due to the excess length of the tape is $\frac{5{,}000}{100} \times 0.02 = 1.00$ ft., or the amount by which the recorded length is too short, so that the corrected length of the line is 5,001.00 ft. On the other hand the error due to the accidental source is $\sqrt{50} \times 0.02$ or ±0.14 ft. The actual length of the line therefore probably falls somewhere between 5,001.00 ± 0.14 ft.

Slope measurements.—Sometimes both ends of the tape are deliberately held in different horizontal planes. The difference in elevation between the two ends of the tape is then determined with a hand level (Fig. 3). The surveyor with the hand level stands an equal distance from points A and B. He need not be on the line joining A and B. With the rod held on the ground at A a reading is taken. The rod is then moved to B and the man with the level reverses his stance; without moving his position he then takes a rod reading at B. The difference between the two rod readings is the difference in elevation between the two ends of the tape.

Fig. 3 is similar to Fig. 2 but in this case not only "s" but also "h" is known. The correction, Ch, to be subtracted from "s" to give the horizontal distance "a," is equal to $h^2/2s$.

This approximate formula can be applied to slopes of about 12° without introducing an error of more than 1 part in 4,000. This corresponds to a difference in elevation between the two ends of the tape of about 21 ft. in a slope distance of 100 ft.

The accompanying brief table shows the corrections to apply to slope length for differences in elevation of 1 ft. up to 10 ft. for slope distances varying in multiples of 10 ft. from 10 to 100 ft.

CORRECTIONS FOR SLOPE MEASUREMENTS

Slope length (ft.)	Difference in elevation, ft.									
	1	2	3	4	5	6	7	8	9	10
10	0.050	0.200	0.450	0.800	1.250	1.800	2.450	3.200	4.050	5.000
20	0.025	0.100	0.225	0.400	0.625	0.900	1.225	1.600	2.025	2.500
30	0.017	0.067	0.150	0.267	0.417	0.600	0.817	1.067	1.350	1.667
40	0.012	0.050	0.112	0.200	0.312	0.450	0.612	0.800	1.012	1.250
50	0.010	0.040	0.090	0.160	0.250	0.360	0.490	0.640	0.810	1.000
60	0.008	0.033	0.075	0.133	0.208	0.300	0.408	0.533	0.675	0.888
70	0.007	0.029	0.064	0.114	0.178	0.257	0.350	0.456	0.579	0.714
80	0.006	0.025	0.056	0.100	0.156	0.225	0.306	0.400	0.506	0.625
90	0.006	0.021	0.050	0.089	0.139	0.200	0.272	0.356	0.450	0.556
100	0.005	0.020	0.045	0.080	0.125	0.180	0.245	0.320	0.405	0.500

Note: Values shown in light-face type will not produce an accuracy of 1 part in 4,000 since the slope exceeds 12°.

Since one of the most common sources of error in the measurement of distance arises from failure to hold both ends of the tape in the same horizontal plane it follows that the lengths of lines as determined by the slope method are much more accurate than when determined by horizontal measurements. The recorded length by the slope method is always less than that by the horizontal method. This difference is appreciable when the measurements are made by inexperienced men.

Sometimes, when measurements are taken along the slope, the angle of the slope is measured by a transit or a clinometer. The clinometer is probably sufficiently accurate for all ordinary requirements. The rear chainman usually sights the head chainman at some point on his body which is equal to the distance from the ground to the eyes of the rear chainman. Occasionally a transit is used and a rod is held at the forward end of the tape as illustrated in Fig. 4. From this figure it is seen that the horizontal distance "a" is equal to the slope distance "s" times the cosine of the angle of depression "α." There are two disadvantages of this method; first if reductions are to be made in the field a table of trigonometric functions must be available, and second, the calculations are more tedious.

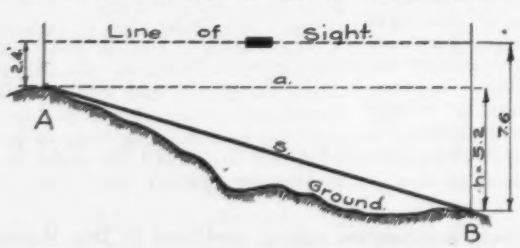


Fig. 3—How measurements are taken along the slope

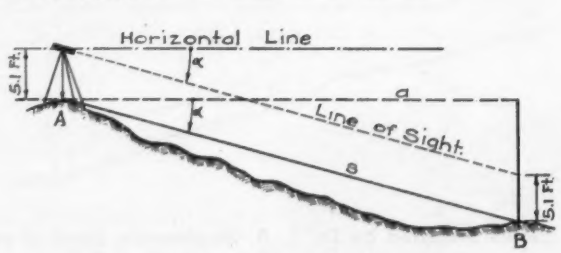


Fig. 4—Use of transit in slope measurements

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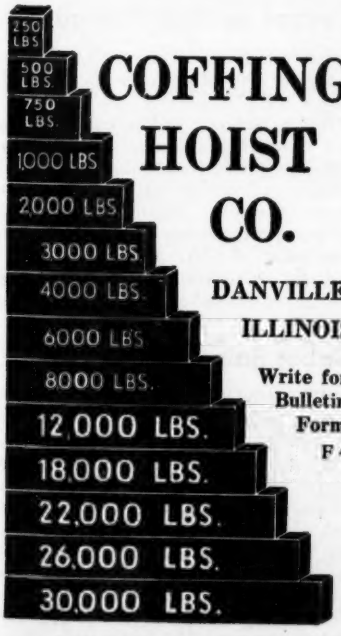

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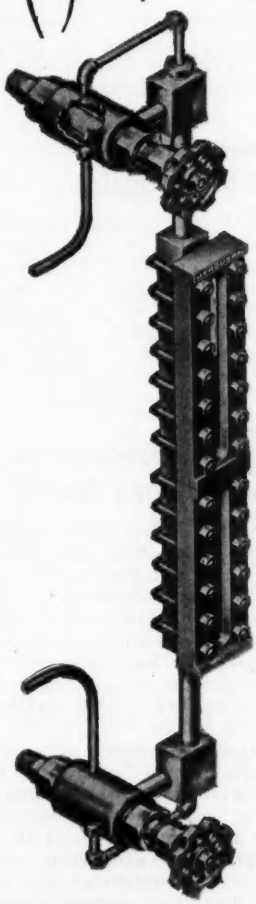

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6-JV-3

Natural Gas

Louisiana Gas Tax Increase Proposed to Legislature

BATON ROUGE, La.—Industry-opposed proposals to increase Louisiana's natural-gas gathering tax were moving toward a showdown last week as two measures were introduced in the state legislature.

Both bills would boost the gathering tax from ½ to 3 cents. The plan is favored by the state natural-gas conservation office to conserve the gas resources, particularly to curb export of gas to coal-producing areas.

It is estimated the increase would raise annual revenue to the state from the tax from $2,500,000 to $15,000,000. Principal difference between the two bills lies in provisions for use of the revenue.

One measure specifies that the tax be paid by pipe-line companies without charging back to producers, land or royalty owners. Casinghead gas used for recycling or similar uses, lawfully flared or used for carbon black production would be exempted.

The tax increase, advocated by P. A. Frye, state gas conservation director, aroused opposition not only from the natural-gas industry but from other business groups who contended it would impair the state's industrial growth. A 5-day prelegislative hearing was held on the proposal earlier this month by the state Revenue Code Commission.

The statistical report of the Interstate Oil Compact Commission giving data for February showed Louisiana as the second largest natural-gas producing state in the nation. Its February production of 49,920,423,000 cu. ft. of dry natural gas was second only to Texas production of 148,308,455,000 cu. ft.

Columbia Gas & Electric To Spend $50,000,000

NEW YORK.—Columbia Gas & Electric Corp.'s projected 3-year program, estimated to cost some $50,000,000, includes the drilling of 1,000 new wells, construction of 250 miles of major pipe lines, installation of additional compressing facilities and further development of underground gas storage.

The company's supply of natural gas will be bolstered by construction of propane-air plants, in which liquid propane is vaporized, mixed with air, and used as a manufactured gas, according to the company's annual report.

Much of the construction is expected to be undertaken in 1946. Applications and notifications are being filed with state and federal authorities and orders have been placed for equipment and materials.

The Ohio Fuel Gas Co., a subsidiary of Columbia Gas & Electric Corp., has been authorized by the Federal Power Commission to expand its present transmission system serving Dayton and neighboring communities.

United Gas to Spend $500,000 in Expansion

HOUSTON, Tex.—United Gas Corp. will spend $500,000 over the balance of 1946, according to J. V. Strange, vice president and general manager. The program calls for expansion in the Houston metropolitan area in the form of line extensions, meters, and regulator installations, incident to the connecting with new customers.

A.G.A. Asks Nominations For Gas Employe Award

NEW YORK.—The American Gas Association is inviting applications from gas utility companies and manufacturer company members for consideration for the 1946 A.G.A. meritorious service award bestowed to the employe who has performed the most meritorious deed during the year beginning July 1, 1945, and ending June 30, 1946.

The award, consisting of a gold medal, button, and certificate, has been bestowed for deeds of judgment, intelligence or bravery connected with the handling of materials of manufacture or the production, manufacture, or distribution of gas. Applications for the current award should be sent to A.G.A. before August 1.

Union Oil Co. Enlarging Cut Bank, Mont., Plant

Union Oil Co. of California is preparing to enlarge its absorption plant near Cut Bank, Mont., at a cost of $200,000.

The contract has been let to Betchel Brothers-McCone Corp. of Los Angeles. Manufacture of liquefied gas will be increased as a result of the expansion. The work is to be completed by September.

Conversion to Natural Gas Is Field for New Company

NEW YORK.—A new company, Conversions & Surveys, Inc., has been organized by Stone & Webster, Inc., to aid manufactured gas companies in converting to natural gas or liquefied petroleum gases.

President of the new company will be John H. Warden, who resigned as general sales manager of Oklahoma Natural Gas several weeks ago. Offices of the company will be with Stone & Webster, Inc., at 90 Broad Street, New York. The services offered by the new company will extend from preliminary planning and engineering to the actual changeover of gas facilities.

Tulsa University to Give Gas Appliances Course

The University of Tulsa is offering a short course on gas appliances June 11-14, to be followed June 18-21 by a similar course on liquefied petroleum gas appliances.

Enrollment for the gas appliances course already totals 165, according to F. T. Gardner, course director. Subjects scheduled include combustion principles, burner design and operation, installation of vents and flues, space heater installation, floor furnace installation, circulating heating systems, and temperature control equipment.

Course on Gas Offered

LAWRENCE, Kans.—At the request of the American Gas Association, the University of Kansas is offering a home study course covering natural gas operations from origin to utilization. Material to be taught was prepared by the department of mining engineering with the help of an advisory committee representing A.G.A. manufacturers of natural gas equipment, and engineers and executives.

Cabot Sale Hearing Set

WASHINGTON.—A Federal Power Commission hearing was to open here this week on the proposal of New York State Natural Gas Corp. to acquire New York and Pennsylvania properties of Godfrey L. Cabot, Inc., and Cabot Gas Corp. and to operate the facilities to deliver gas at wholesale to Pavilion Natural Gas Co., Producers Gas Co., Southern Tier Gas Corp., Empire Gas & Fuel Co., Ltd., and Rochester Gas & Electric Co.

PIPE LINES

New Station Completed On Rangely Crude Line

DENVER.—The Utah Oil Refining Co.'s booster station on the line from Rangely field, Colorado, to Wamsutter, Wyo., is being completed this week and will increase the capacity of the line to 26,400 bbl. daily. Crude runs from the field are at present averaging 20,000 bbl. daily from 68 wells.

Pipe Lines Take Half Of Panhandle Gas

AUSTIN, Tex.— Pipe lines distributing fuel within and without the state claimed more than half the natural gas produced in Texas Panhandle gas field in April, the monthly summary of the Texas Railroad Commission shows.

Of the total of 2,360,076,000 cu. ft. produced daily in the commission's District 10, comprising the Panhandle field, 1,276,191,000 cu. ft. went to pipe lines for ultimate sale.

The report showed ultimate disposition of other gas as extraction loss in gasoline plants 70,833,000 cu. ft. daily; plant fuel, lease operations and repressuring, 174,546,000 cu. ft. daily; vented, 2,024,000 cu. ft. daily; and to carbon black plants, 836,483,000 cu. ft. daily.

Exemption Is Extended For Panhandle Eastern

WICHITA, Kans.—The Kansas Corporation Commission has continued until November 1 the exemption of Panhandle Eastern Pipe Line Co. from the basic shut-in for overproduced wells in the Hugoton gas field.

The commission's order pointed out that the company has voluntarily shut in heavily overproduced wells in an effort to equalize production between leases. The order said the gas transmitted by Panhandle Pipe Line is vital to the reconversion program and that the company is making every effort to drill additional wells and connect others to its system.

The company expects to add 52 more wells to the 163 wells connected to its Hugoton system as of March of this year, the commission's order added. The additions will consist of 29 company-drilled wells, one drilled under 50 per cent company ownership; and 22 connected under gas purchase contracts.

Ohio Fuel Gas Project Authorized by FPC

WASHINGTON.—A $266,000 pipe line project to allow Ohio Fuel Gas Co. to furnish improved wholesale natural gas service to Dayton Power & Light Co., Dayton, Ohio, has been authorized by the Federal Power Commission.

The facilities consist of about 15 miles of 12¾-in. transmission line, located in Montgomery and Miami counties, Ohio, extending from Ohio Fuel Gas's existing 16-in. transmission line connecting with Panhandle Eastern Pipe Line Co.'s system; about 1 mile of 12¾-in. line to Tripp City, Ohio; and auxiliary equipment.

The authorization for the project was given following an unprotested hearing. According to Ohio Fuel Gas the new facilities will enable it to

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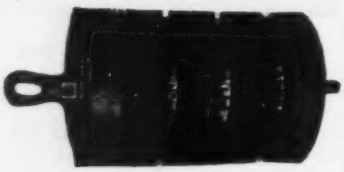

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PRODUCT LINES
NATURAL GAS LINES

FOR DETAILS WRITE

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Fort Madison, Iowa

serve the Dayton company with a stabilized mixture of gases which the company is now furnished. Ohio Fuel Gas said that the present method had resulted in unsatisfactory utilization of gas in Dayton, particularly in industries with critical appliances and equipment, and that the new facilities would not be used to serve new markets beyond the normal growth of business in the area.

Financing Texas-California Line Before Stockholders

A special meeting of stockholders of El Paso Natural Gas Co. has been called for June 12 to authorize financing of the proposed gas pipe line from Texas to the Arizona-California line.

Hearings have been held on the project in Washington and in Los Angeles by the Federal Power Commission, and a decision by the commission is expected soon.

The line will extend near Dumas in Moore County, Texas, to Blythe, Calif. From that point, Southern California Gas Co. and Southern Counties Gas Co.—subsidiaries of Pacific Lighting Co.—propose to build a 214-mile line to connect with the Los Angeles gas system.

Testimony at the hearings centered on the need for the line in view of California's own dwindling gas reserves. The two California companies originally proposed a 26-in. line with an initial capacity of 175,000,000 cu. ft., but have since asked authority to increase its size to 30 in. in view of the possible future load 30 per cent greater than originally anticipated. The companies also have disclosed they will pay 13½ cents for Texas gas instead of the 11 cents as originally planned. Pipe will cost $2,500,000 more than was estimated.

The original application of El Paso Natural Gas asked permission of FPC for a 1,000-mile 24 and 26-in. line. It estimated initial capital costs of facilities to deliver 125,000,000 cu. ft. daily at $27,822,000.

FPC Hearing Set June 10 On $11,574,000 Expansion

WASHINGTON. — Hearing on the application filed by Mississippi River Fuel Corp. of St. Louis, Mo., for authority to construct additions to its gas transmission system from the Monroe gas field, Monroe, La., to St. Louis has been set for June 10.

The program will consist of a series of partial loops in each section of the company's main line which begins at Perryville, La., and continues through Arkansas and Missouri into Illinois. This construction will require same 265 miles of 22-in. pipe. Additional compressor units will be installed at eight stations.

The proposed facilities will increase Mississippi River Fuel's gas capacity by 50,000,000 cu. ft. daily at an estimated cost of $11,574,000.

FPC Permit for New Line Asked by Cities Service

WASHINGTON.—Cities Service Gas Co. last week placed before the Federal Power Commission its application for authority to build a 405-mile gas transmission line from the Hugoton field in western Kansas to Wichita and Kansas City.

The company also asked permission to loop an existing line in Oklahoma and to install other additions to its pipe line system. Estimated cost is approximately $23,000,000. Construction is scheduled to begin in April 1947. The company's application said a market survey last year indicates that during the next 4 years the peak-day domestic demand upon the Cities Service system will be increased by 220,000,000 cu. ft. and the peak-day industrial demand by 76,000,000 cu. ft. The proposed 405-mile 26-in. pipe line would extend through Newton and Emporia to near the city limits of Kansas City.

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REFINING

Pure Oil Constructing Coking Unit at Toledo

TOLEDO, Ohio.—Pure Oil Co. has begun construction of a coking unit which, when completed, will round out processing operations of the company's refinery here.

The unit is designed to provide lighter fractions while reducing heavy fuel oil to coke. Completion is due this year, but officials point out progress will largely depend on availability of materials. Pure Oil's plant here has a listed crude charging capacity of 29,400 bbl. daily. It is one of the company's major refining units.

Ohio Oil to Modernize Robinson, Ill., Refinery

FINDLAY, Ohio.—A modernization program is planned by Ohio Oil Co. for its Robinson, Ill., refinery, including the construction of catalytic cracking facilities of 12,500 bbl. daily capacity.

A brief statement of plans for the plant was given Ohio Oil stockholders by C. Z. Hardwick, vice president in charge of refining and marketing, at the annual meeting here last week.

Daliy average raw crude oil throughput will be 25,000 bbl. daily. Present capacity of the plant is listed at 15,000 bbl. crude charge, and 9,000 bbl. cracking, polymerization included. Approval has been granted by Civilian Production Administration for the construction, Hardwick said.

Hardwick told the stockholders it is anticipated refinery operations will remain at a high level during the remainder of the year. He said that during the first quarter of 1946 crude processed in the company's two refineries at Robinson and at Lovell, Wyo., averaged 22,000 bbl. daily, an increase of 17 per cent over the comparable 1945 period. In reviewing production operations, W. B. Emery, vice president in charge, said that for the sixth successive year, the company's previous crude production records were broken with net production in 1945 averaging 89,933 bbl. daily. Net production in the first 3 months of 1946 averaged 85,400 bbl. daily.

Coast Plants Operating at 60 Per Cent of Capacity

HOUSTON.—Refiners in the Gulf Coast Refiners Association cut crude runs to still the first half of May, with a total of 95,778 bbl. daily, or 60.6 per cent of capacity, compared with 63.3 per cent the latter part of April.

The association's semimonthly report said that three refineries in the group were not operating during the period.

Stocks of all grades of gasoline and naphthas at 1,883,639 bbl. reflected a decrease of 102,391 bbl. Aviation gasoline stocks May 1 of 335,231 bbl. indicated a decrease of 1,984 bbl. Automotive gasoline stocks alone totaled 1,100,490 bbl. on May 15, showing a decrease of 183,235 bbl. Naphtha and unfinished gasoline stocks increased 82,828 bbl. to 447,918 bbl. on May 15.

Kerosene stocks were 219,293 bbl. May 15, an increase of 38,225 bbl. Diesel gas oil stocks May 15 were 127,896 bbl., an increase of 58,683 bbl. Stocks of other grades of gas oil dropped 80,908 bbl., to 539,594 bbl. on May 15.

Carbon Monoxide Detection Described in U. S. Report

WASHINGTON.—A new method of determining the amount of carbon monoxide gas contained in air, based upon the quantitative reaction of red mercuric oxide with the gas, is described in a report released by the Publication Board, Department of Commerce.

The report, by Arnold C. Beckman, James D. McCullough, and Robert A. Crane, is a National Defense Research Committee study. Carbon monoxide reacts with red mercuric oxide to

UP-TO-DATE PIPELINE MAPS

JACOBSON'S MAP SHOWING CRUDE OIL AND GASOLINE PIPELINES OF THE UNITED STATES
SIZE 48"x75" SCALE 1" = 40 MILES

JACOBSON'S MAP SHOWING NATURAL GAS PIPELINES OF THE UNITED STATES
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Baton Rouge Construction Planned by Ethyl Corp.

BATON ROUGE, La.—A construction program involving two new buildings costing approximately $1,000,000 is scheduled here by Ethyl Corp.

C. W. Bond, Ethyl plant manager here, said one building will house the development laboratory and pilot plant and the second will contain the medical and personnel departments of the plant. Bids, he said, will be issued next autumn, and construction will start as soon as permits are obtained.

Texas Co. to Modernize Refinery at Casper, Wyo.

NEW YORK.—The Texas Co. will spend $6,000,000 in a modernization program at its Casper, Wyo., refinery.

Additional facilities will consist of a fluid catalytic cracking and gas recovery unit, a new crude still and equipment for making road oils and asphalt products.

Peacetime Use Evaluated In Sale of U. S. Unit

WASHINGTON. — In establishing "fair value" for the sale of the government - owned catalytic - cracking plant at Salt Lake City to Utah Oil Refining Co., War Assets Administration said it was necessary to evaluate not only the obsolescense of certain parts of the plant's equipment but also the practicability of normal peacetime operation of war-inspired processes.

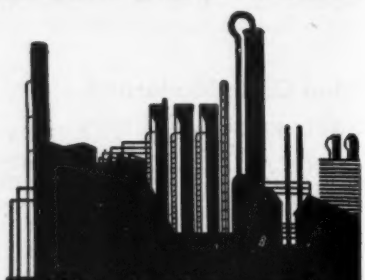
The sale of the plant for $4,148,300 was announced last week. It was the first government-owned catalytic cracker sold since the war. The property included a 27-acre site, adjacent to the company's refinery, commercial value of fluid cracking unit, vapor recovery facilities, sulfuric acid alkylation unit and auxiliary equipment and tankage, and the salvage value of other parts of the plant not usable in commercial operation.

In arriving at the sales figure, WAA took into consideration the location of the plant in relation to its market and source of raw material and the design and efficiency of its operation compared to estimated realization from dismantling and sale of machinery and equipment.

Utah Oil Refining leased and operated the plant during the war. It will use the former government unit to manufacture high-octane motor gasoline. Crude capacity of Utah Oil Refining's present plant at Salt Lake City is listed at 16,000 bbl. daily. The fluid-type government cracking unit had a charging capacity of 8,500 bbl. daily. The sulfuric acid alkylation unit produced 3,000 bbl. daily. Isomerizate production was 1,000 bbl. daily.

Asphalt Plant Opens

JACKSON, Miss.—Mississippi Asphalt Co.'s new plant, located north of Sandersville in Jones County, has begun production. The refinery is expected to be completed within 60 days and will run gasoline and other crude products. It is southern Mississippi's first oil refinery and the second for the state.



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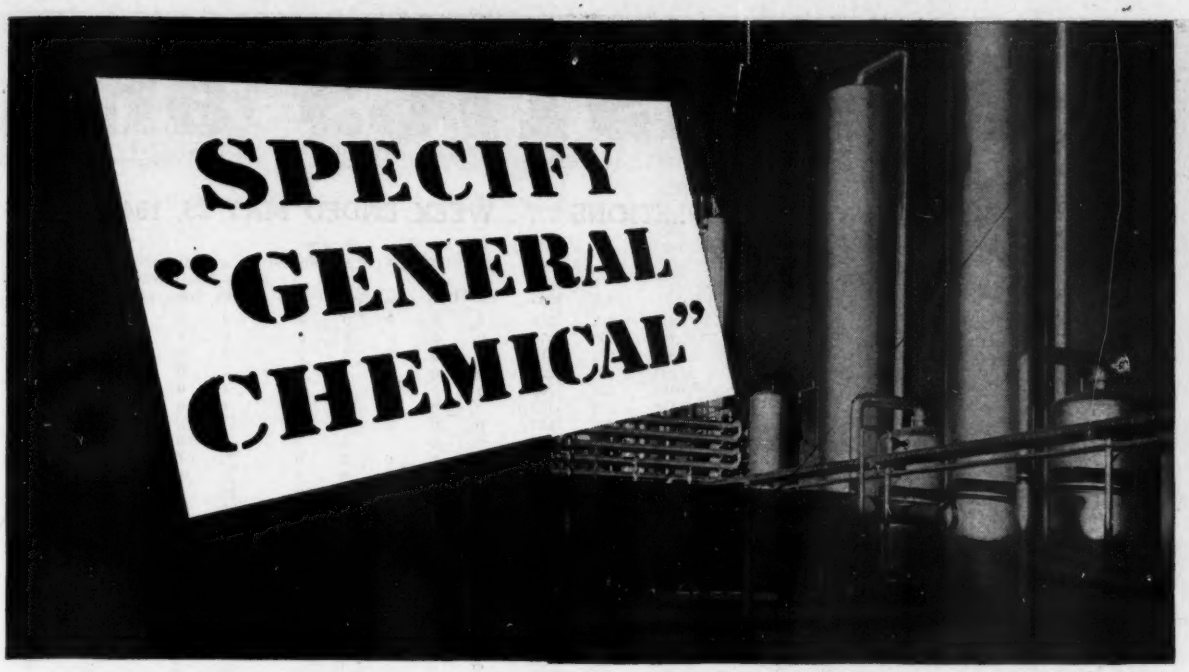

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Oil Well Acidizing: Muriatic Acid
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Treating Agents: Aluminum Chloride Solution—Aluminum Sulfate
Mud Conditioning: Sodium Silicate—Disodium Phosphate—Trisodium Phosphate—TSPP (Tetrasodium Pyrophosphate)
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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 25, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	29	15	0	*14	41,341	618	511	0	0	0	0	0	0	0	0	0	0
Pennsylvania	78	42	2	†34	115,253	1,589	1,476	0	0	0	0	0	0	0	0	0	0
West Virginia	13	1	9	3	40,570	274	311	0	0	0	0	0	0	0	0	0	0
Ohio	22	7	11	4	66,291	450	314	0	0	0	0	0	2	0	9	16	27
Indiana	5	2	0	3	9,601	126	65	0	0	0	0	0	1	0	0	8	9
Kentucky	10	8	2	0	14,167	175	147	0	0	0	0	0	2	0	0	15	17
Illinois	37	27	0	10	87,396	827	627	0	0	0	5	5	17	0	0	145	162
Michigan	19	8	3	8	43,057	287	295	0	0	1	6	7	8	0	2	92	102
Kansas	39	20	4	15	130,053	775	616	0	0	0	6	6	11	0	3	94	108
Neb., Mo., Iowa	0	0	0	0	0	7	12	0	0	0	0	0	0	0	0	4	4
Oklahoma	38	21	6	‡11	115,018	918	941	2	0	2	5	9	28	0	14	113	155
Texas	166	102	3	61	733,849	3,185	2,851	3	3	0	27	33	79	17	9	490	595
North Central	66	35	0	§31	162,499	1,123	816	0	0	0	9	9	22	0	0	200	222
West	29	25	0	4	151,194	686	762	1	0	0	2	3	23	0	0	69	92
Panhandle	4	2	1	1	10,235	142	224	0	0	0	0	0	0	0	0	4	4
Eastern	15	10	2	3	65,386	305	122	0	0	0	1	1	7	0	1	39	47
Gulf Coast	43	27	0	16	310,404	724	664	2	3	0	11	16	21	15	4	103	143
Southwest	9	3	0	6	34,131	225	263	0	0	0	4	4	6	2	4	75	87
Louisiana	23	14	2	7	146,363	529	368	1	0	0	3	4	25	5	3	70	103
Northern	14	6	2	6	58,870	¶284	118	1	0	0	2	3	5	0	0	¶40	¶45
Southern	9	8	0	1	87,493	245	250	0	0	0	1	1	20	5	3	30	58
Arkansas	3	2	0	1	11,454	72	67	1	0	0	1	2	3	0	0	11	14
Mississippi	3	1	1	1	13,156	93	136	0	0	0	1	1	1	0	1	23	25
Southeastern states	2	1	0	1	6,734	18	16	0	0	0	1	1	0	0	0	15	15
Montana	8	3	1	4	16,446	101	126	0	0	0	2	2	4	0	0	10	14
Wyoming	8	6	0	2	35,389	65	83	2	0	0	1	3	8	0	3	20	31
Colorado	3	3	0	0	19,702	47	10	0	0	0	0	0	2	0	0	7	9
New Mexico	8	4	0	4	28,297	148	193	0	0	0	3	3	2	0	0	19	21
California	29	22	1	6	100,945	721	930	0	0	0	5	5	4	0	2	90	96
Utah	0	0	0	0	0	2	3	0	0	0	0	0	1	0	0	1	2
Total United States	543	309	45	189	1,774,982	11,027	10,098	9	3	3	66	81	198	22	46	1,243	1,509
Total previous week	558	307	53	198	1,921,360	10,484	9,577	8	0	2	68	78	189	19	43	1,177	1,428
Total May 26, 1945	521	288	37	196	1,894,337	10,098	7,697	9	1	0	61	71	229	6	51	1,281	1,567

Service wells included: *14, †34, ‡11, §3. ¶Revised.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.250-6.500	5.500-5.750
Texas Gulf Coast	6.375	5.750
New York Harbor	7.375	6.375
California	6.00-6.875	

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-35
Oklahoma (Group 3)	3.000	3.800
N. Texas (f.o.b. plant)	3.500	3.000
N. Louisiana (f.o.b. plant)	2.875	3.375
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl

East Texas	$1.35
Conroe	1.53
Tepetate, Louisiana, svg. grav.	1.30
Illinois Basin	1.47
Pecos County, Texas	1.05
Bradford, Pennsylvania	3.10
Van, Van Zandt County, Texas	1.18

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.90	....		
19-19.9	.94	....	$1.16	$0.80
20-20.9	.98	$0.95	1.18	.82
21-21.9	1.02	.97	1.20	.84
22-22.9	1.06	.99	1.22	.86
23-23.9	1.10	1.01	1.24	.88
24-24.9	1.13	1.03	1.26	.90
25-25.9	1.17	1.05	1.28	.92
26-26.9	1.21	1.07	1.30	.94
27-27.9	1.25	1.09	1.32	.96
28-28.9	1.28	1.11	1.34	.98
29-29.9	1.30	1.13	1.36	1.00
30-30.9	1.33	1.15	1.38	1.02
31-31.9	....	1.17	1.40	1.04
32-32.9	....	1.19	1.42	1.06
33-33.9	....	1.21	1.44	1.08
34-34.9	....	1.23	1.46	1.10
35-35.9	....	1.25	1.48	1.12
36-36.9	....	1.27	1.50	1.14
37-37.9	....	1.29	1.52	1.16
38-38.9	....	1.31	1.54	1.18
39-39.9	....	1.33	1.56	1.20
40 and above	....	1.35	1.58	1.22

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended May 18, 1946

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Distillate	Residual
East Coast	802	22,950	10,092	7,497
Appalachian	157	3,666	487	336
Ill., Ind., Ky.	756	20,831	4,101	3,276
Okla. Kan., Mo.	389	8,131	1,691	1,106
Inland Texas	217	2,982	310	695
Tex. Gulf Cst.	1,189	14,820	5,560	4,770
La. Gulf Cst.	293	4,109	1,653	1,206
N. La., Ark.	57	1,759	441	193
Rocky Mt.	134	2,324	424	711
California	762	15,478	7,427	22,085
Total 4-18-46	4,756	97,050	32,186	41,875
Total 5-11-46	4,820	96,158	31,736	41,008
Total 5-19-45	4,951	88,533	29,859	38,852

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
May 18, 1946	222,113,000
May 11, 1946	221,615,000
May 19, 1945	221,861,000

*Excludes unrefinable Calif. stocks

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	May 25 crude oil	Bureau of Mines May demand	May 18 crude oil
Alabama	1,100	700	1,050
Arkansas	77,850	79,000	78,100
California	868,750	840,000	867,750
Colorado	28,140	23,000	27,360
Eastern	66,350	62,900	66,900
Florida	250	200	250
Illinois	209,600	204,000	209,600
Indiana	19,000	16,400	18,450
Kansas	270,150	252,000	245,300
Kentucky	30,650	30,000	31,500
Louisiana	379,650	380,000	378,500
North Louisiana	88,200	.....	87,050
South Louisiana	291,450	.....	291,450
Michigan	48,050	46,000	47,600
Mississippi	63,150	53,000	60,750
Montana	23,660	22,000	23,660
Nebraska	750	800	800
New Mexico	95,300	99,000	94,500
Oklahoma	372,900	370,000	373,250
Texas	2,114,800	2,050,000	2,114,800
East Texas	388,800	.....	388,800
East Central Texas	139,600	.....	142,100
North Central Texas	164,800	.....	165,000
Texas Panhandle	83,000	.....	83,000
West Texas	521,100	.....	521,200
Southwest Texas	331,500	.....	327,900
Texas Gulf Coast	486,000	.....	486,800
Wyoming	106,020	97,000	103,820
Total United States	*4,776,120	4,626,000	*4,743,940
Change from prev. week, up	32,180		

Cum. production Jan. 1-May 25 ..... †677,884,989 bbl.
Same period last year ....692,637,250 bbl. (crude plus condensate)
*Not incl. 25,650 bbl. condensate. †Incl. 3,695,250 bbl. condensate.

CRUDE-OIL STOCKS 222,113,000 bbl. as of May 18—up 498,000 bbl. One year ago 221,861,000 bbl.

GASOLINE STOCKS 97,050,000 bbl. as of May 18—down 1,108,000 bbl. One year ago 88,533,000 bbl.

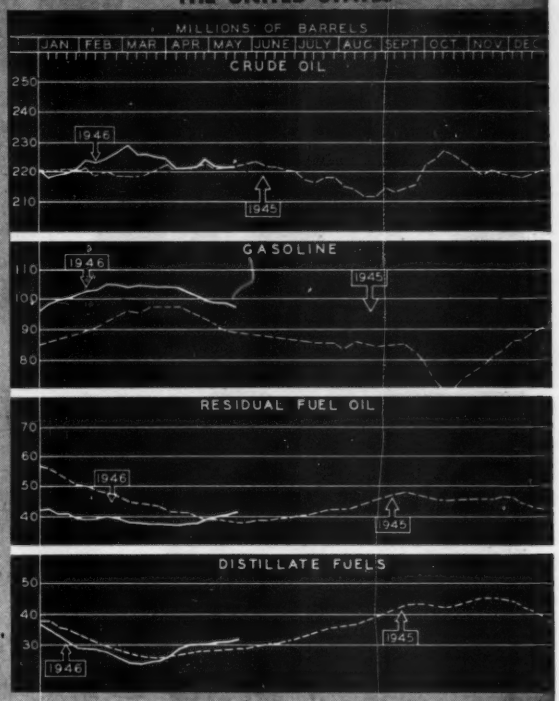
RESIDUAL FUEL-OIL STOCKS 41,875,000 bbl. as of May 18—up 867,000 bbl. One year ago 38,852,000 bbl.

GAS OIL AND DISTILLATE STOCKS 32,186,000 bbl. as of May 18—up 450,000 bbl. One year ago 29,859,000 bbl.

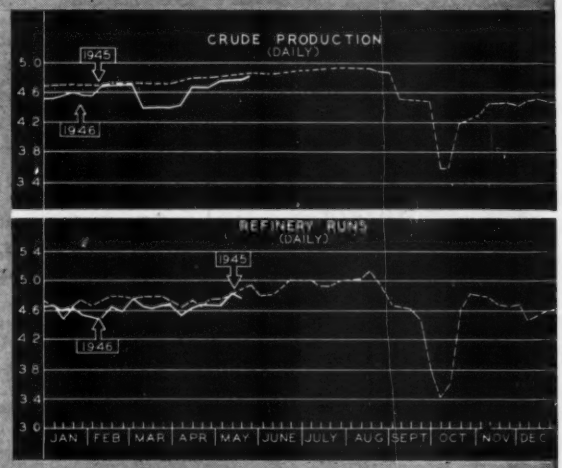
CRUDE-OIL PRODUCTION 4,776,120 bbl. as of May 25—up 32,180 bbl. One year ago 4,868,050 bbl.

REFINERY RUNS 4,756,000 bbl. daily week ended May 18—down 64,000 bbl. One year ago 4,951,000 bbl.

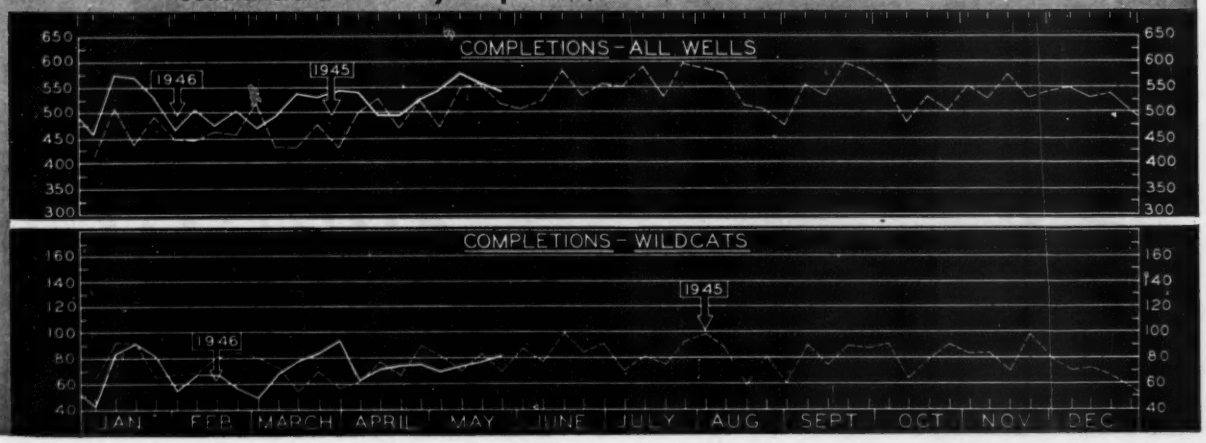
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



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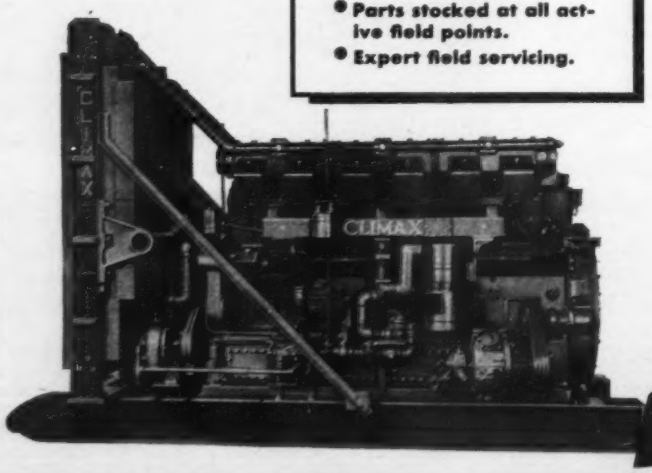

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Exploration and Drilling

What Is the Geological Fence?

WITH the postwar revival of interest in research on the origin of oil, many oil men are hearing reference to "The Geological Fence" for the first time, and are wondering what it means. Like most odd-sounding phrases in our industry, when understood, it turns out to be a common-sense thing, with good reasons back of the phrase.

When the American Petroleum Institute decided to sponsor coordinated, large-scale research into the origin of oil, it became obvious that among the research workers would be men who were outstanding in such scientific fields as chemistry, physics, bacteriology, etc., but who knew very little about the geology of oil.

Without guidance, they might spend a great deal of time and money checking theories that looked promising to them, but which could not possibly fit into the known geological conditions under which oil is found. Therefore, after consultation with a large number of prominent geologists, a set of limiting conditions was agreed upon. These defined certain conditions within which any theory on the origin of oil must fit, if it was to check the actual conditions under which oil is found.

These conditions were named the geological fence. Research in any science must stay within certain boundaries outlined by the fence. There are two kinds of fence posts, one group practically fixed; the other group which seem likely, but which may be pulled up and either moved out, or completely discarded if new evidence changes the picture.

There are five fixed fence posts: (1) organic origin, (2) marine environment, (3) temperature limits, (4) pressure limits, and (5) time interval. The geological evidence in favor of oil originating from organic material is almost overwhelming. Marine origin is fixed because 99 per cent of the oil fields are found in marine sediments, the remaining 1 per cent in sediments deposited in brackish water. Temperature limits must not substantially exceed 212° F., the boiling point of water, judging from oil-reservoir temperatures, and other geological evidence. Pressures required must not exceed 5,000 psi., except for shear pressures. Thickness of sediments, and other geological evidence indicate this limit. Time interval is included because no oil has been found to date in sediments more recent than Pliocene. This indicates that roughly the youngest oil found to date is about a million years old.

Any theory on the origin of oil that the scientists wish to check, must be a process of making oil that is physically feasible within these limiting conditions. Thus the geological fence keeps the scientists in the various fields from straying out of bounds.

ROCKY MOUNTAIN

Rangely Outpost Produces From Sand in Red Beds

DENVER.—The Rangely field in western Colorado developed a surprise in Continental Oil Co. 2 Rooth, C SW SW 15-2n-103w, an outpost on the west side and a south offset to its 1 Rooth, a recent extension of the proven area 1½ miles to the northwest. It topped the red beds at 5,965 ft., 69 ft. lower than in the well on the north. Then it went into a stray sand at 6,109 ft. and drilled to 6,121 ft. when it began showing gas and oil, cleaning the hole. The well did not get out of control, although it required all of the ingenuity of the crew to keep it from breaking loose. Tons of mud were pumped into it in an effort to kill it and at last apparently had succeeded. As soon as the hole is conditioned, drilling will continue on to the objective Weber sand. The oil is approximately 36°-gravity crude. This is the first well in the field to show oil and gas in sand in the red beds. The electric log of the well on the north showed a slight bulge in the graph at that point, but nothing considered significant. It was necessary to bleed the well at frequent intervals to relieve the heavy pressure. Whether the drill struck a pocket, a heretofore undetected lenticular sand, or a new pay is not apparent at this time.

Texas Co. 6-21 Union Pacific, C SW SW 21-2n-102w, an outpost on the north, which last week showed salt water and no oil or gas in a drill-stem test at 6,578-6,605 ft., was plugged back from 6,641 ft. to 6,425 ft., and completed as an excellent producer, making 1,546 bbl. in 20 hours through the tubing. Ground elevation is 5,315 ft., top of the Weber at 6,088 ft.

Cobb-Stringer-Newton 1-D Government, C SE SE 4-1n-102w, an outpost on the south, which last week was reported to have cored 24 ft. of saturated sand at 6,835-59 ft. in an unidentified horizon, believed by some to be the lower Weber, is conditioning hole and preparing for a drill-stem test of that section.

Sheldon Dome discovery.—The Toronto Pipe Line Co. has contracted with Phillips Petroleum Co. for 5,000 bbl. of crude from 1 Shoshone, C NE NE 16-5n-2w, Sheldon Dome, Fremont County, Wyoming, for the purpose of making a test of the well, a discovery in the Embar in August 1945, but shut in for lack of marketing outlets. The well flowed 469 bbl. in 11 hours through the tubing before being shut in. The oil runs 36.2° gravity. Stanolind Pipe Line Co. line from Elk Basin to Casper runs mostly low-gravity crude from the Big Horn Basin fields and Sheldon Dome has not been put on regular production up to now due to difference in the grades of crude. Carter and Kerlyn Oil companies hold joint interests in the Sheldon Dome operation and further development is expected to take place this year.

New operations.—Twenty-three new operations were reported, the largest number for any week this year, of which six are in Colorado, six in Wyoming, eight in Montana, and three in northwestern New Mexico. Seven are wildcats. Colorado new operations include four in the Rangely field, one each by Texas and California companies and two by the Idaho-Sharples-Wasatch group. The wildcats include a shallow test in the Kennsburg district, Weld County, in J. W. Clayton 1 Powers, NW NW 22-2n-65w, and Byrd-Frost, Inc. 1, SE 14-38n-2e, Archuleta County. The later is located 2 miles north of the Gramps pool in the Price district. It is moving in and expects to spud by June 1. The six in Wyoming include one each by Continental Oil Co. in South Elk Basin and Mule Creek Oil Co. in Byron. The other four are wildcats. One of these is P. N. Fortin 1 Government, W½ 14-42n-62w, Dewey district, Weston County. The Mush Creek Syndicate made two locations on Mush Creek in Weston County in 1 Government, NE SW 1-43n-63w, and 2 Government, NW NE 15-44n-63w. These will explore the territory around a discovery made in Western Oil Trust in C NW SE 24-44-63 in 1944 which flowed 80 bbl. at 3,855 ft. The other wildcat is M. D. Miller 1 Miller, C NE NW 9-52n-61w, Canyon Creek district, Crook County.

Montana new operations were all development wells, four in Kevin-Sunburst, two in Pondera, and one each in Cut Bank and Cat Creek. The Cat Creek well will be of special interest as it will test the new Ellis sand in the field to the west of the producers. It is Continental Oil Co. 11 Harlan, SW SW NW 10-15n-29e.

New Mexico operations include one on Barker Creek by Southern Union Production Co. and two wildcats. One of the latter is Richfield Oil Corp. 1 Drouthe-Boothe, NW NW SE 4-15n-6w, on Ignacio Chavez Grant in McKinley County, which will test the Pennsylvanian to 8,000 ft. George P. Livermore has the contract and is moving in a heavy rotary. The other wildcat is William Mansfield 3 Mansfield-Federal, SE NW NE 29-30n-9w, Blanco district, San Juan County. It is near the old Huntington Park Oil Co. 2 Goede in Section 29, which was completed at 1,750 ft. in 1933, and has supplied the town of Aztec with gas ever since.. Mansfield has acquired a block of 12,000 acres and will drill a number of tests with slim hole rotary to work out the geology.

The Clayton test in Weld County, Colorado, will explore a 30-35-ft. sand at 500-

550 ft. in the base of the Laramie and the Millikin sand in the Fox Hills at 800 to 900 ft., and determine the Pierre contact with a view to an 8,000-ft. test to the Dakota.

Completions.—Twenty wells were completed, of which 11 were oil wells with initial production of 2,988 bbl., 1 was a gas well, and 8 were dry holes. These were distributed: Colorado, 3 completions, 3 oil wells, initial production 1,942 bbl., all in the Rangely field. Wyoming, 8 completions, 6 oil wells for 862 bbl. initial, and 2 dry holes. Montana, 8 completions, 3 oil wells for 184 bbl., 1 gas well, and 4 dry holes. Northwest New Mexico, one completion, a dry hole. The Wyoming completions, exclusive of wildcats, were one each in Rex Lake, East Lance Creek, Garland, Maverick Springs, and Frannie. The Montana completions, exclusive of two wildcats, were two in Cat Creek, two in Kevin-Sunburst, and one each in Bowdoin and Cut Bank.

WYOMING SUCCESSFUL WILDCATS

Church Butts, Uinta County: Mountain Fuel Supply Co. 1 Unit, C SW NW 8-16n-112w, TD 12,894 ft. Final report, drillstem test only in Dakota at 12,550-12,650 ft., 12,000,000 cu. ft. of gas and 240 bbl. of oil in 24 hours, still testing.

Skull Creek, Weston County: Morton & Seigel 1 State, C SW NE 16-44n-62w, TD 3,412 ft., PB to 3,365 ft., and completed in Muddy sand for 12 bbl. per day.

WYOMING WILDCAT FAILURE

North Lamb, Big Horn County: Yellowstone Drilling Co. 1 Government, SE SE NE 11-51n-93w, on Cities Service Oil Co. lease, dry at 1,540 ft.

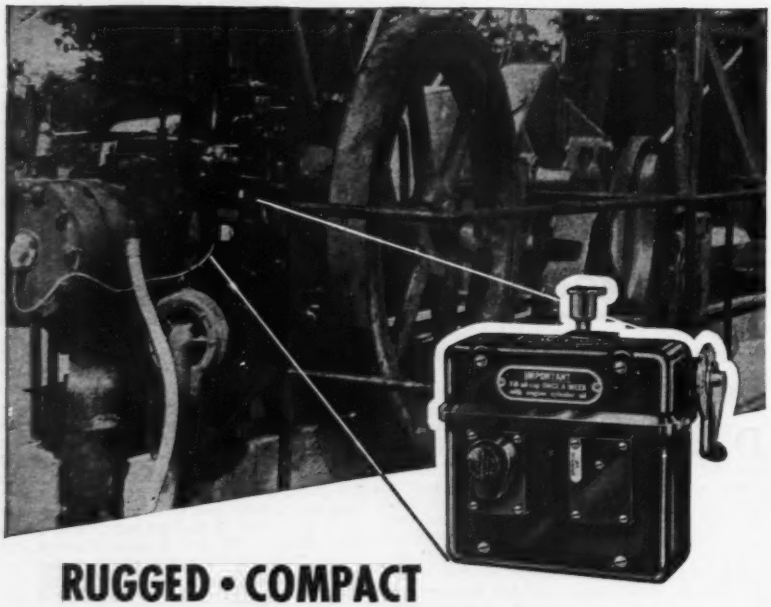
MONTANA WILDCAT FAILURES

Kevin-Sunburst, Toole County: Consolidated Gas Co. 1 State, NE SE SE 16-35n-4w, TD 2,407 ft., Ellis-Madison 2,370 ft., dry, ½ mile west of production.

North Cut Bank, Glacier County: Pardee-Inland Empire Ref. Co. 1 McAlpine, SE SE NW 11-37n-5w, TD 2,987 ft., top of Madison 2,972 ft., 2,200 ft. water, dry.

NORTHWEST NEW MEXICO WILDCAT

Pino Mesa, San Miguel County: H. A. Hirshfield & Co. 2 Pino Mesa, C SE NW 14-12n-22e, TD 4,550 ft., dry in granite.



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TEXAS GULF COAST

Gas-Condensate Sand Found In Chocolate Bayou Field

HOUSTON.—A new gas-condensate sand has been opened at Chocolate Bayou field of Brazoria County by Phillips Petroleum Co. 1 M. V. Armstrong, a north outpost test, in the Hooper & Wade Survey, Abstract 424, Section 15. Pipe was perforated with 44 shots from 10,644-59 ft. and on an initial gage the well flowed 72 bbl. of condensate with an unestimated volume of gas with 4,175 lb. flowing pressure on the tubing. Total depth was 11,653 ft., and the well has been plugged back to 10,796 ft. for completion.

Sun 1 Texas Public Service Farms Co., wildcat test on the South Nome prospect, 1½ miles east of Nome field production, Jefferson County, in Jno. W. Kirby Survey, made a second drill-stem test and recovered salt water and oil. On drill-stem test at 6,284-94 ft. tool was open for 22 hours, using ¼-in. chokes top and bottom, but the well would not flow. Test was completed dry at total depth of 10,300 ft.

Dick Schwab 1 O. H. Caldwell, wildcat test 3 miles south of production in the Fairbanks field, Harris County, in A. G. Holland Survey, is setting 5½-in. production string for test. Total depth is 8,475 ft., and operators will run casing to bottom. The test attempted to blow out while drilling in sandy shale at 8,315 ft. and it is reported that it flowed some oil before being brought under control.

Four new operations have been staked in the Sugar Valley area of Matagorda County. Three of the tests, each contracted to 10,000 ft., were staked by E. C. Hebert. The tests are the 1, 2, and 3 E. C. Hebert, on a 52.6-acre lease in the Amos Rawls League and are approximately 3,000 ft. north of Stanolind Oil & Gas Co. 1 Hurlock, which has indicated production to give the proven portion of the pool a north extension. The fourth new location is the Skelly Oil Co. 1 Dodd, in Burnett and Sojourner Survey. This test is to be drilled to 9,500 ft. and is a west offset to Stanolind 1 Hurlock.

The Upper Gulf Coast district received 21 new locations this week, including 4 wildcats, 1 each in Chambers, Galveston, Jackson, and Liberty counties. Fort Bend, Jefferson, and Wharton counties led in completions this week each receiving four. Of the eight wildcat completions only one was successful, being a new pay in South Liberty field, Liberty County. Two of the seven dry wildcats are in Jefferson County while Chambers, Fort Bend, Hardin, Montgomery and Wharton counties each received one.

UPPER GULF COAST SUCCESSFUL WILDCAT

Liberty County: New oil sand, South Liberty field—Sun Oil 12 Shade fee, David Minchey League, TD 4,900 ft., top sand 4,585 ft. Cook Mountain, perf. 119 holes 4,585-4,615 ft. PT 103 bbl. per day through a ⅛-in. choke, gas-oil ratio 1,291 to 1, TP 810 lb., gravity 37°, no water.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: Sun 1-A Frankland, Smith Point area in Henry Barker Survey, dry, TD 9,522 ft.

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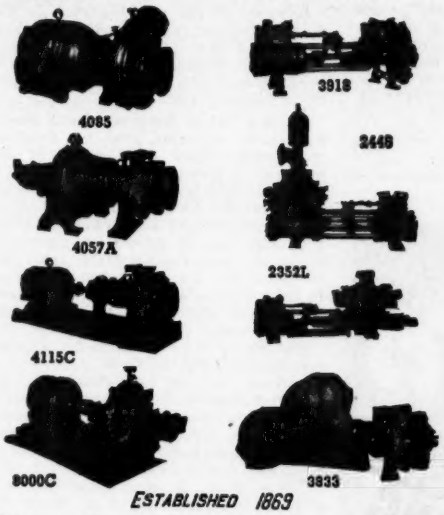

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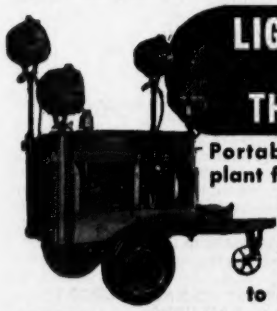

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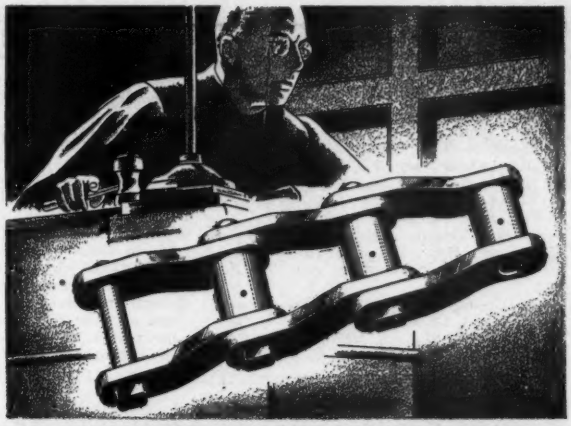

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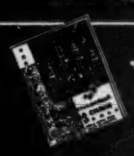

Union Bulletin O-1 covers Oil Field Chain. Ask for your copy.

UNION CHAINS

Fort Bend County: W. L. Goldston 1 Louis Kramer, E. P. Olcott (H&TC) Sur., 3 mi. W of Needville, dry, TD 6,465 ft.

Hardin County: McCarthy O. & G. Corp. 2 Grayburg Timber Co. in the South Lake area, HT&B Sur., dry, TD 9,965 ft.

Jefferson County: McCarthy 1 Mrs. L. Johnson et al, in Fannett area, in W. H. Smith League, dry, TD 10,006 ft.

Sun 1 Texas Public Service Farms Co., in John W. Kirby Sur., 4 mi. SE of Nome, dry, TD 10,300 ft.

Montgomery County: F. A. Callery 1 Thompson Bros. Lbr. Co., R. O. Lusk Sur., 4 mi. N of Magnolia, dry, TD 10,512 ft.

Wharton County: H. W. Snowden (Croate & Davis) 1 Chas. A. Davis, in S. Castleman Sur., 2½ mi. NE of Lane City production, dry, TD 5,510 ft.

SOUTHWEST TEXAS

Brooks County Gets New Gas-Condensate Field

CORPUS CHRISTI.—A new gas-condensate pool has been opened in Brooks County by Shell Oil Co., Inc. at its 1 Cage Ranch, wildcat 3½ miles northwest of Barrosa, in Jesus Guzman Survey. Initial gage was 4,500,000 cu. ft. of gas and 80 bbl. of condensate per day through a ¼-in. choke, tubing pressure 3,800 lb., through perforations at 8,022-36 ft. in top part of a thick sand section. On previous test at 8,080-98 ft. well flowed gas and salt water through a ¼-in. choke, with 2,800 lb. tubing pressure, 3,000 lb. casing pressure. Total depth is 10,009 ft. with 5½-in. casing at 9,030 ft.

W. H. Holland 1 Roos-Bennett, prospective oil field opener in Starr County, between Garcia and Boyle fields, in Share 100 of Porcion 93, recovered 720 ft. of 26°-gravity oil on a drill-stem test at 2,959-86 ft., with 175 lb. working pressure, in 18 minutes, through a ¼-in. top choke. Operators now are coring ahead at 3,250 ft.

A show of gas was reported in the top of the Midway at 960 ft. in C. W. Voyles 1 Moncure Estate, 4 miles southwest of Bastrop, in M. Rosseau Survey, Bastrop County. Operators are drilling ahead from 3,053 ft. in Austin chalk.

Humble Oil & Refining Co. 1 Mrs. Kate Bradshaw, probable first oil producer in the Carrizo Park area, south of Carrizo Springs, in Dimmit County, has set 5½-in. casing at 2,875 ft. and is preparing to perforate for completion. Three drill-stem tests have indicated oil production at the 2,800-ft. depth. Test at 2,800-07 ft. recovered 175 ft. of oil; test at 2,807-13 ft. recovered 235 ft. of oil and test at 2,816-31 ft. is reported to have recovered 235 ft. of oil. Test in a lower sand at 2,900-13 ft. recovered mud and salt water. Total depth is 2,965 ft.

Humble 1 N. P. Hatchett, outpost test ½ mile northeast of E. M. Jones 2-C Ezzell discovery well at San Caja field of McMullen County, has set 5½-in. casing at 6,989 ft. to complete as a gas-condensate well in the Wilcox zone. Total depth 6,995 ft. Drill-stem tests in 6,900-ft. level recovered gas and condensate.

There were 34 new locations reported this week, 7 wildcats, 2 in Webb County and 1 each in Bastrop, Karnes, Kleberg, Live Oak, and McMullen counties. Of the 36 completions 12 were wildcats, 4 successful, 1 each in Bee, Brooks, Jim Wells, and Willacy counties, and 8 dry holes, 1 each in Bee, Caldwell, Dimmit, Goliad, San Patricio, Starr, Victoria, and Zavala counties. Nueces County received the greatest activity reporting five completions.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Bee County: New gas-condensate pool—Bridwell Oil Co. 1 J. W. Baird in J. G. Rountree Sur. 8, 1 mi. W of Bridwell 1 Sliva, Stillwell sand oil discovery, top pay 4,392 ft. Stillwell sand, TD 4,407 ft., perf. 12 holes 4,392-95 ft. PT: 997,500 cu. ft. gas and 18 bbl. condensate per day through a 5/32-in. choke, TP 1,625 lb., no water.

Brooks County: New gas-condensate pool—Shell Oil Co. 1 Cage Ranch, Jesus Guzman Sur., 3½ mi. NW of Barrosa, TD 10,009 ft., perf. 60 holes 8,022-36 ft., PT 4,500,000 cu. ft. gas through ¼-in. choke with 80 bbl. condensate per day, TP 3,800 lb., CP 3,000 lb., no water.

Jim Wells County: New oil pool—Ralph E. Fair, Inc. et al 1 Reynolds & Richardson, W. N. Staples Survey 210, 1 mi. NW of Magnolia City field, 6 mi. SE of Alice, TD 5,883 ft., perf. 5,402-14 ft., PT 76 bbl. oil per day through 11/64-in. choke, gas-oil ratio 2,850 to 1, TP 610 lb., CP 1,100 lb., gravity 41°, no water.

Willacy County: New gas-condensate pool—Magnolia & Abercrombie 1 C. E. Todd, San Juan De Carricitos Grant, 5 mi. W of Raymondville, 2 mi. NW of La Sal Vieja field, TD 11,651 ft., perf. 7,540-60 ft., PT: 40 bbl. condensate and estimated 4,000,000 cu. ft. gas per day through 5/16-in. choke, gas-oil ratio 97,741 to 1, TP 2,675 lb., SIP 3,337 lb., gravity 55°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bee County: Producers Corp. of Nevada et al 1 Wolters, in Refugio County School Land Sur. 11, dry, TD 4,472 ft.

Caldwell County: Stanley A. Thompson 1 Lydia D. Carvenka, Jonathan Burleson Sur., dry, TD 2,160 ft. in Edwards lime.

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Dimmit County: Barnsdall 1 Sarah W. Hendrichson, Lot 5, Block 15, Good Luck Colony Subdn., 2 mi. SE of Valley Wells, dry, TD 5,280 ft.

Goliad County: P. R. Rutherford 1 H. Riemenschneider, H. M. Sally League, 5 mi. NW of Meyersville, dry, TD 8,010 ft.

San Patricio County: Phillips 1 Mrs. Ola McCann Unit 10, W. Smith Sur., 6 mi. E of Gregory, dry, TD 10,505 ft.

Starr County: Geo. Echols 1-A Garcia, Sur. 949, 15 mi. NE of Rio Grande City, dry, TD 3,180 ft.

Victoria County: Taylor Refg. Co. et al 1 Leon Raaz, Louis Kratz Sur., 10 mi. E of Victoria, dry, TD 5,145 ft.

Zavala County: Ring & Arsht 2 Joe L. Matthews, I&GN RR Sur., 6 mi. W of LaPryor, dry, TD 2,230 ft.

CANADIAN FIELDS

Gas Production Proved In Lloydminster Field

CHATHAM.—In the Alberta end of the Lloydminster field, Ponalta Oils 2, LSD 8, 12-49-1w4, finished at 1,889 ft., has initial pumping production of 30 bbl. of 14°-gravity oil.

In the Saskatchewan end of the field, Community Services 14 has set casing in the oil sand at 1,870 ft. and is testing. Community 12 has proved the presence of gas in the area 5 miles south of Lloydminster, a drill-stem test at the top of the lower Cretaceous showing 2,700,000 cu. ft. with 180 lb. back pressure. Four new nests are starting, one drilling, and four finished wells waiting for pumping equipment.

Kinsella.—In the Kinsella field, east-central Alberta, Imperial Oil has completed two new gassers which will further extend the field. Imperial 10, LSD 10, 29-49-13w4, finished at 2,211 ft., is testing. Imperial 13, LSD 10, 15-46-10w4, with production indicated at 2,157 ft., extends the producing area to the southeast. Imperial 14 is starting. Northwestern Utilities 18, LSD 10, 20-48-11w4, is at 2,232 ft. and testing, and Northwestern 21, LSD 6, 13-48-12w4, is starting.

Sullivan Creek.—On the Sullivan Creek structure, west of South Turner Valley, Phillips Petroleum 2, LSD 8, 22-18-5w5, has discontinued drilling and temporarily abandoned operations at 3,501 ft. after failing to reach a recurrence of the Madison limestone. The lime was first encountered at shallow depth but the well faulted to upper formations before satisfactory porosity was reached.

Crossfield.—In the Crossfield area northeast of Turner Valley, Imperial-Anglo-Canadian 1, LSD 9, 11-28-2w5, is continuing tests of the upper formations after encountering water in the Madison lime. The basal lower Cretaceous above the lime was shot with 120 quarts, increasing the gas flow from 400,000 to 670,000 cu. ft. and tests are being continued to determine the value of the oil recovery. Later the higher sands will be perforated and tested.

Lethbridge.—In the Lethbridge area, southern Alberta, Imperial-Lethbridge 2, LSD 15, 35-7-22w4, finished at 6,426 ft., encountered oil shows in the Devonian limestone which after exhaustive tests failed to develop commercial production. The well is being abandoned.

Del Bonita.—In the Del Bonita area, in southern Alberta, McLeod-Del Bonita 1, LSD 13, 14-1-21w4, is deepening below whipstock after running casing to 4,550 ft. The previous drilling got the Madison lime, potential producing horizon, at 4,900 ft.

Grease Creek.—An agreement covering prospective development of the important Grease Creek structure in the central Alberta foothills has been concluded between Northwest Co., wholly owned subsidiary of Imperial Oil, and Grease Creek Petroleums. Northwest Co. will undertake seismographic work over 12,200 acres on structure and will keep the leases in good standing. Following the survey either company may start a drilling program, the other particiapting in cost and production on a 50 per cent basis. Preliminary work will be started this season.

Calling Valley.—Oil and gas indications encountered in Royalite-De Winton 1, LSD 14, 16-21-1w5, east of Turner Valley, may lead to completion of Sentinel 1, LSD 15, 8-20-2w5, standing unfinished since 1940. Sentinent 1, located in what is known as the "front line fold," was carried to 7,660 ft., encountering gas in three horizons and oil shows at 4,255 and 4,870 ft.

CALIFORNIA

New Pool Discovered In Los Angeles County

LOS ANGELES.—Standard Oil Co. has apparently proved the existence of a new accumulation of oil about 1 mile northwest of the Aliso Canyon field of Los Angeles County. There is no question about the discovery but it remains to be seen whether this accumulation will show flowing production at higher structural locations. This section of the state is badly broken up by faulting and major displacements and hence it is quite difficult to evaluate the importance of a discovery until two or more wells have been com-

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pleted. Aliso Canyon is very prolific, however, and consequently it is logical to assume that Standard's discovery may prove of major importance from a production standpoint. An anticlinal structure is suspected but the affect of faulting cannot be determined fully at this time. In some of these Newhall-Castaic region fields, surface formations appear badly broken up by faulting but uniform normal dips are found with depth.

J. Paul Getty added about 80 acres to the productive acreage of the Mountain View field this week by completing 11 Derby, located along the east edge of the field in Section 33-30s-29e. This new well was finished flowing at a daily rate of 625 bbl. of clean pipe-line oil from 5,403 ft. Its completion proves up several additional locations and it is quite likely Getty will undertake additional drilling after the current completion has been on production for a few weeks.

Ohio Oil Co. recoverd the fish several days ago in its Gardena wildcat and work has again been resumed following a delay of about a month. The present well, in basement schist at 10,290 ft., is being prepared for an early production test but since no data is being released the outlook for production is conjectural. No points have been realesed but it is quite definitely known that Ohio's current well is substantially higher structurally than the company's initial test which was abandoned several months ago because of the inability to shut off water. Ohio's current wildcat at Gardena is 1 Gardena Community Four in Section 23-3s-14w, and its location is about 1 mile northwest of the initial test.

Completions were substantially below the number of new locations made during the current week but this is a temporary condition and will be averaged out during the next couple of weeks. A number of wells have been held up because of casing shortage and some are ready for completion if enough pipe for a water string could be secured. Other wells have not been spudded because the operator could not be assured of early delivery of equipment.

SUCCESSFUL CALIFORNIA WILDCAT

Los Angeles County, West Aliso Canyon: Standard 1 Wigdal, 19-3n-16w, pumped 270 bbl., 18.7-gravity, 9.5 per cent cut, TD 9,525 ft., PB 9,385 ft., perforated 9,285-9,385 ft., Eocene production, Miocene barren, fault between this location and production in Aliso Canyon field.

CALIFORNIA WILDCAT FAILURES

Kern County, Kern River: Bender Oil Operations 1 Clair, 22-28s-28e, bottomed in barren gray sand, top Olcese 853 ft., top Pyramid Hills sand 2,725 ft., top Vedder sand 2,767 ft., all sands barren, TD 2,789 ft.

Tejon: L. S. Gilmour & Associates 1 Tejon, 36-32s-29e, bottomed in granite, top granite 2,376 ft., no showings, TD 2,445 ft.

Los Angeles County, Leffingwell: Standard 1 Behnke Community, 14-3s-11w, bottomed in gray sand, form. test 5,080-5,167 ft., recovered mud and water, form. test 5,600-80 ft. recovered salt water, TD 10,273 ft.

Monterey County, Moss Landing: Bayside Dev. Co. 1 Vierra, 7-13s-2e, bottomed in hard gray sand, only minor showings, did not recover fish in hole, TD 7,926 ft.

Tehama County, Paskenta: Northern Oil & Gas Co. 1 Tiger, 1-23n-7w, bottomed in barren gray sand, no showings, TD 2,569 ft.

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MICHIGAN

Clare County Scene of Deep Gas-Distillate Discovery

SAGINAW.—Pure Oil Co. is preparing for installation of high-pressure separator and other equipment at the scene of its 1 Freer, gas-distillate discovery in Section 18, Garfield Township, Clare County, and is planning offsets. Sohio Oil Co. also plans tests on its acreage in the area.

Pure is going ahead in the belief the Freer is the most important deep test development in recent years. Unofficially estimates are that the well will produce between 200 and 300 bbl. of distillate per day in addition to a large amount of natural gas. In a 10-minute week-end test, Pure reported that the well gaged 26,500,000 cu. ft. through 2-in. tubing perforated at between 5,039 and 5,064 ft. Pressure was reported to be about five times greater than that in the shallow Michigan Stray gas formation.

Pure rotary cored considerably deeper than 5,064 ft. A test made through perforations between 5,077 and 5,087 ft. showed 4,250 ft. of salt water in 1 hour, with a slight amount of gas.

The Freer development comes at a time when the final chapter is written in another deep test in Michigan. Gulf Refining Co. announced this week it has abandoned 1 Bateson, deepest test ever drilled in Michigan. The Bateson was drilled in 1941 to 10,447 ft. After drilling to the record depth the well was plugged back to 7,810 ft. There was some gas and oil recovery, but when plugging operations started last month salt had bridged the hole at 6,500 ft.

Michigan field operations in the past week resulted in eight oil producers, three gas wells, eight dry holes. Two more big

producers in the Arenac-Deep River field topped the list. Of the seven wildcats, all were dry except for a small gas well in Ogemaw County.

Four of 11 new locations are for tests in Montcalm County, 3 each for Allegan and Mecosta, 1 for Ogemaw.

MICHIGAN SUCCESSFUL WILDCAT

Ogemaw County, Churchill Township: Sun Oil Co. 1 Adams-Walker, C NW 12-22n-3e, gas well, 540,000 cu. ft., TD 1,464 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Hopkins Township: Victory Oil & Developjment Co. 1 S. & S. Miles, NE SE NE 6-3n-12w, dry in Traverse lime, TD 1,625 ft.

Isabella County, Isabella Township: Gordon Oil Co. 1 C. F. & H. F. Foley, SE SW NW 29-15n-4w, dry in Dundee, TD 3,804 ft.

Midland County, Ingersoll Township: Dow Chemical Co. 1 Ernest Schreiber, NW SE SE 2-13n-2e, dry in Dundee, TD 3,791 ft.

Montcalm County, Maple Valley Township: West Michigan Consumers Co. 1 J. Max Baty, NW SE SE 17-11n-9w, dry, TD 1,163 ft.

Ogemaw County, Goodar Township: Ohio Oil Co. G-3 Mio Unit, C N½ 29-24n-4e, dry, TD 1,780 ft.

Osceola County, Sylvan Township: Ashby Drilling Co. 1 F. E. Ferguson, NE SW NW 15-18n-7w, dry, TD 1,561 ft.

PERMIAN BASIN

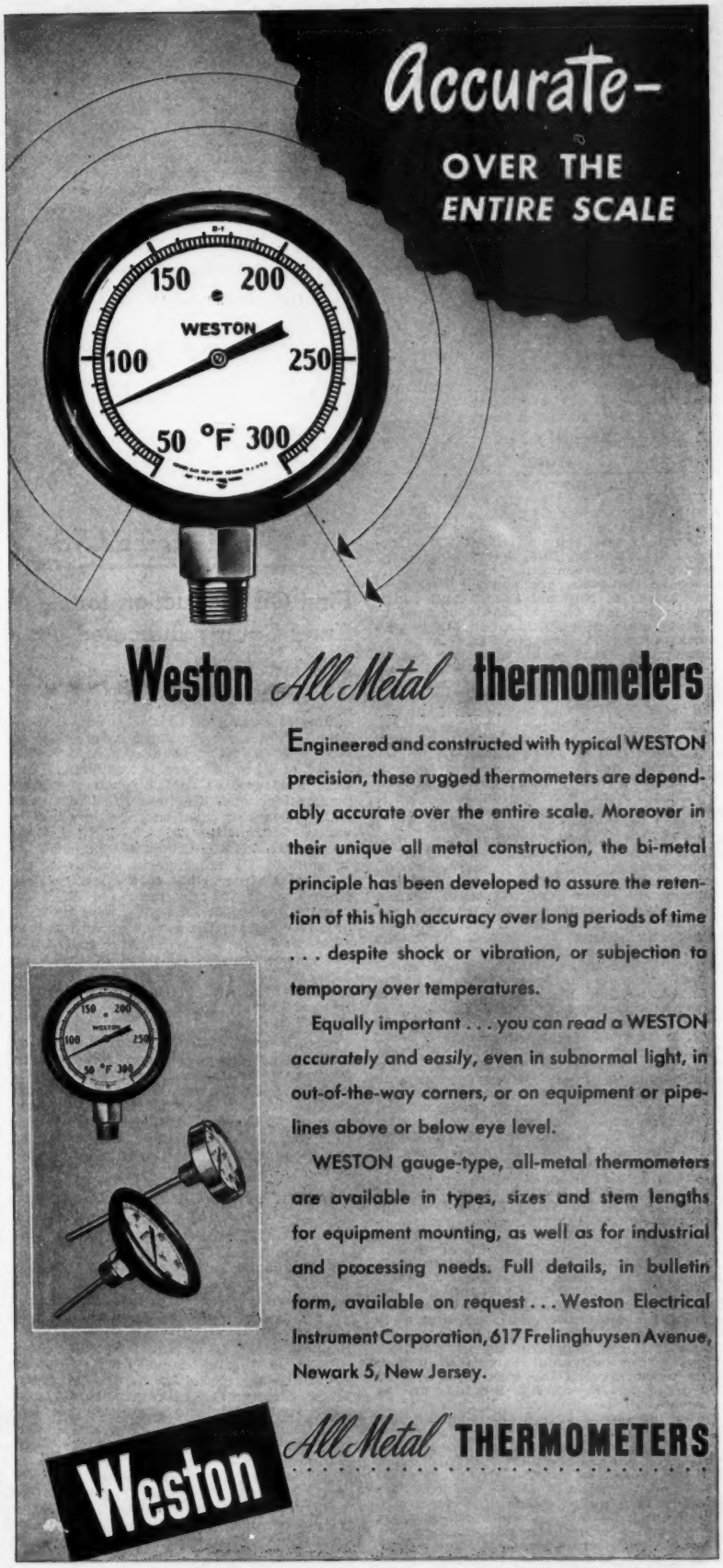
Ector County Wildcat May Open New Pool

MIDLAND.—Cities Service Oil Co. 1 J. E. Parker, Section 20, Block 44, T-2-S, T&P Survey, deep test 1¼ miles west of the Harper (San Andres) pool of central Ector County, ran a drill-stem test of the Fusselman section of the Silurian from 11,387-468 ft. There was sweet gas to the surface in 35 minutes, gaging 11,640 cu. ft. daily at the end of 3½ hours. The packer failed at the end of 3¾ hours. Operator pulled 4,370 ft. of dry drill-pipe, then two stands of gas-cut mud. The well unloaded some oil-cut mud and 1,116 ft. of heavily oil-cut mud was recovered. The next 1,100 ft. of pipe held oil and gas-cut mud, with the bottom 3,650 ft. being mud slightly cut with gas. Operator was drilling below 11,478 ft.

John W. Murchison 1 Fraser (The Texas Co.), Section 7, Block 45, T-2-S, T&P Survey, Devonian discovery 3½ miles south of Devonian production in the TXL field, but on a separate structure, Ector County, failed to flow when opened for official gage. It was swabbed and recovered some oil, then salt water. Survey indicated water was coming from the bottom 7 ft. of the hole. Operator will plug back with plastic in an effort to shut off the water.

Humble Oil & Refining Co. 1 Pio Crespi, Section 19, Block 38, T-2-S, T&P Survey, 1 mile northwest of the Strawn discovery of the Midland pool, Midland County, will attempt completion in the Devonian. Operator cemented 5-in. liner on bottom, ran electrical survey and was preparing to perforate. Total depth is 11,620 ft.

Fullerton field, Andrews County, Sand Hills Tubb field, Crane County, Welch field, Dawson County, Keystone-Ellenburger field, Winkler County, each had two completions this week. Means field, Andrews County, had six locations and Welch field, Garza field, Garza County, Sharon Ridge field, Scurry County, each had four. TXL field, Ector County, has 36 drilling wells; Keystone-Ellenburger field, 26; Fullerton field 25; Block 31 field, Crane County, 20; Welch field 11 and Todd Deep field, Crockett County, 8.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WEST TEXAS SUCCESSFUL WILDCAT

Andrews County: Extension to old oil pool—Superior Oil Co. 1 Eva Coopwood, Sec. 4, Blk. A-47, PSL Sur., 4 mi. S Fullerton pool, elev. 3,270 ft., flowed 691 bbl. day through ½-in. choke on 2½ tubing at 6,997 ft. Clear Fork, top of pay 6,885 ft., gravity 42.1°, gas-oil ratio 1,275 to 1, TD 7,002 ft.

WEST TEXAS WILDCAT FAILURES

Andrews County: Atlantic 1-B University-Texas, Sec. 15, Blk. 12, University Lds., 19 mi. W Andrews, elev. 3,294 ft., San Andres 4,540 ft., dry, TD 4,965 ft.

Stanolind 1-HH University, Sec. 12, Blk. 8, University Lds., 6 mi. NE Fasken, elev. 3,015 ft., Grayburg 4,530 ft., San Andres 4,810 ft., dry, TD 5,600 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—The Texas Co. 4 Blineberry, 20-22s-38e, ½ mile north of Drinkard production, Lea County, apparently having missed the Drinkard pay, was reaming to 7,190 ft., total depth, to drill ahead. Sixty-five feet of gas-cut drilling mud with no oil shows was recovered on a 4-hour drill-stem test from 7,000-7,116 ft. Humble Oil & Refining Co. 1-B Federal Leonard, 12-26s-37e, Ellenburger test ¼ mile north of the discovery in eastern Lea County, was drilling below 11,435 ft. in lime. This is the deepest test ever drilled in New Mexico. So far it has failed to show any signs of production.

Grayburg-Jackson and Fren fields, Eddy County, and Paddock and Eaves fields, Lea County, each had one completion this week. Drinkard field, Lea County, had three locations and Paddock field, Lea County, two. Caprock field, Lea and Chaves counties, has 23 drilling wells; Drinkard field 15; Grayburg-Jackson and Square Lake fields, Eddy County, 12; Paddock field 6, and Empire field, Eddy County, and West Roberts field, Lea County, four each.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURES

Lea County: Amerada 1 Hooper, 27-19s-35e, 6 mi. W Eunice-Monument pool, elev. 3,733 ft., Dowden 3,005 ft., dry, TD 3,500 ft.

Southern Union Gas Co. 1 English, 26-18s-33e, between Corbin and Tonto pools, elev. 3,811 ft., dry, TD 5,323 ft.

LEGAL

OIL AND GAS LEASE

UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Jackson, Mississippi, May 28, 1946. Sealed bids in duplicate will be received until 10:00 A.M., Central Time, June 28, 1946, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on four blocks of National Forest land which are divided into twelve parcels, located in Sharkey and Jefferson Counties, Mississippi. Block number one contains Parcel A of approximately 994.56 acres, more or less, in Township 11 North, Range 6 West, Section 36, SE¼; Township 10 North, Range 5 West, Section 6, W½ SE¼ and W½ less 8.62 acres; Section 7, Lots 2 and 3. Parcel B, of approximately 601.26 acres, more or less, in Township 10 North, Range 6 West, Section 1, entire less 2.25 acres. Parcel C, of approximately 600.76 acres, more or less, in Township 10 North, Range 6 West, Section 2, entire. Parcel D, of approximately 598.43 acres, more or less, in Township 11 North, Range 6 West, Section 35, E½; E½ NW¼ and E½ W½ NW¼; Section 36, NW¼. Block number two contains Parcel A of approximately 644.36 acres, more or less, in Township 11 North, Range 5 West, Section 31, entire less 1.92 acres, Parcel B of approximately 645.30 acres, more or less, in Township 11 North, Range 6 West, Section 36, NE¼; Township 11 North, Range 5 West, Section 30, S½ and S½ N½. Parcel C, of approximately 646.66 acres, more or less, in Township 11 North, Range 5 West, Section 19, W½; W½ SE¼ and S½ NE¼; Section 30 N½ N½. Parcel D of approximately 612.77 acres, more or less, in Township 11 North, Range 5 West, Section 19, E½ SE¼; Section 20, SW¼ and S½ NW¼; Section 29, W½ less 30 acres. Block number three all in Township 10 North, Range 6 West, contains Parcel A of approximately 640.38 acres, more or less, in Section 32, E½; Section 33, E½ NW¼; Section 34, NW¼ and W½ NE¼. Parcel B of approximately 632.42 acres, more or less, Section 27, entire. Parcel C of approximately 721.83 acres, more or less, in Section 25, SW¼; Section 26, S½; Section 36, NW¼ and N½ SW¼. Parcel D of approximately 468.71 acres, more or less, in Section 23, S½ S½; Section 24, S½. Block number four all in Township 9 North, Range 4 East, contains approximately 534.08 acres, more or less, in Section 13, NW¼ SW¼; Section 14, S½ NW¼ and S½ and Section 15, N½ SE¼. Bids may be submitted for an entire block or separately for any or all Parcels thereof, or in both ways. If the aggregate of the several high bids on the individual Parcels of a specific block exceeds the maximum bid for the block as an entirety, the bids on the parcels will be accepted. If, however, a bid on a block as an entirety is higher than the aggregate of the high bids on several Parcels thereof, then the bid on the entire block will be accepted. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Masonic Building, U. S. Forest Service, Jackson 114, Mississippi.

N. CENTRAL TEXAS

First Oil Production for Knox County Indicated

WICHITA FALLS.—Cities Service Oil Co. 1 Mulkey, Section 163, Block 44, H&TC Survey, wildcat 2 miles south of Truscott, having promised the first oil production for Knox County, reperforated with 72 shots from 6,222-40 ft. and swabbed approximately 50 bbl. of oil in 10 hours. It was then treated with 1,000 gal. of acid through the same perforations and the hole filled with salt water. Operator is attempting to shut off water. Continental Oil Co. 1 Garlington, Block 3422, TE&L Survey, Montague County wildcat, 1½ miles north of Bowie, ran a 1-hour drill-stem test in the Marble Falls from 6,417-31 ft. and recovered 50 ft. of slightly gas-cut drilling mud with no show of oil or water. There was no bottom-hole pressure. It was being drilled deeper. Grace & Grace 2 Edwards, Block 16, G. C. Bruner Survey, Archer County wildcat 15 miles southwest Wichita Falls, was perforating from 5,250-80 ft. and 5,520-40 ft. to test the Caddo.

Electra field, Wichita County, had six completions this week and Rogers field, Montague County, had three. Electra field had six locations and Wilson field, Cooke County, three. National field, Wilbarger County, has seven drilling wells; Wilson field six, Sivell's Bend field, Cooke County, and Nocona field, Montague County, five each.

NORTH TEXAS WILDCAT FAILURES

Archer County: Fain-McGaha 1 Wm. E. Huff et al, M. Fanning Sur. A-128, 4 mi. E and ½ mi. N Holliday, elev. 1,010 ft., KMA 4,230 ft., dry, TD 4,397 ft.

Grace & Grace 2 S. T. Russell, Lot 7, Crawford Subd. of I. Holman Sur., 3 mi. S and 6 mi. E Megargel, dry, TD 1,389 ft.

Baylor County: C. G. Hart 2 M. & L. Howe, Lot 20, Graves Subd. of S. D. Ward Sur. A-560, elev. 1,222 ft., dry, TD 301 ft.

Foard County: DeKalb Agricultural Assoc. 1 P. L. Kincaid, Isaac Aldridge Sur., 4½ mi. S and 3 mi. E Crowell, elev. 1,462 ft., Mississippian 5,562 ft., Ellenburger 5,932 ft., dry, TD 5,953 ft.

Jack County: Hanlon-Buchanan 1 Mrs. M. E. Munson, TCRR Sur. A-2046, 6 mi. E and 3 mi. S Antelope, dry, TD 600 ft.

Wichita County: D. N. Bolin 1 V. I. Seiler, Blk. 296, Waggoner Col. Subd., 3 mi. E and 7 mi. N Electra, dry, TD 2,709 ft.

Scott Bros. et al 1 J. L. Jackson, Leag. 4, Blk. 16, Denton CSL Sur., dry, TD 1,257 ft.

WEST CENTRAL TEXAS

ABILENE.—A new oil pool in Taylor County, 4 miles south of Merkel, was opened by West Central Drilling Co. et al 1 C. H. Murphree. It is estimated good for 75 to 80 bbl. daily on the pump in the Cook lime from 2,622-29 ft. It was indicated an attempt at dual completion might be made. The discovery is in Section 1, Block 9, SPRR Survey. Fred Manning 1 C. J. O'Connor, Section 52, Block 7, T&P Survey, which was completed as a gas well in December 1945, has been completed as a Caddo discovery, flowing 40 bbl. of oil hourly through ½-in. choke. Gas production was from 3,207-3,348 ft. When operator deepened to 3,403 ft., the well started flowing oil naturally.

Ingram and Reddin fields, Taylor County, and Cooper field, Jones County, each had one completion this week. Cisco field, Eastland County, Ingram field and Coleman County Regular field each had one location. Cisco field has four drilling wells; Reddin field three; Silver Valley field, Coleman County, Palo Pinto County Regular field, Stephens County Regular field and Loving field, Stephens County, each have two.

WEST CENTRAL TEXAS WILDCAT FAILURES

Jones County: G. C. & J. L. Howell 1 G. M. Gillespie, Sec. 45, OAL Sur., 6 mi. SE Anson, elev. 1,731 ft., Swastika 2,468 ft., dry, TD 2,500 ft.

Shackelford County: Carl Hovgaard 1 A. A. Gustafson, BBB&C RR Co. Sur., 10 mi. NW Budmathews, elev. 1,516 ft., dry, TD 3,335 ft.

APPALACHIAN FIELD

Large Gas Wells Feature West Virginia Completions

PITTSBURGH.—In Elk district, Kanawha County, West Virginia, United Fuel Gas Co. completed 5,730 Ego Gallati, a former shallow well deepened to the Oriskany sand, which gaged 7,154,000 cu. ft. gas, natural. From a surface elevation of 1,205 ft., the Corniferous lime was topped at 5,326 ft., and the Oriskany at 5,448-73 ft., with gas at 5,453-67 ft., total depth 5,473 ft.

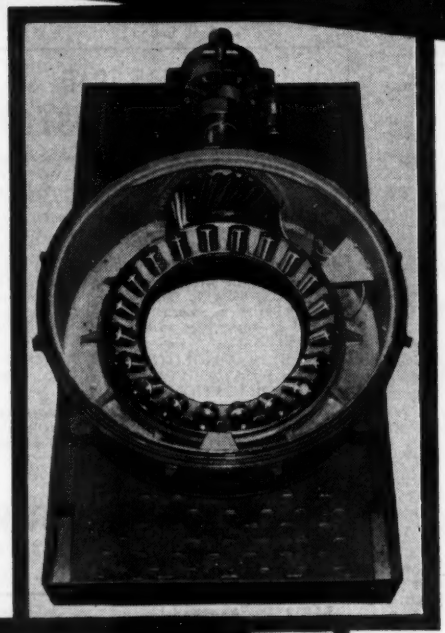
In Jackson County, United Carbon Co. completed the test 1,348 J. H. Waskey in Ravenswood district, good for 4,915,000 cu. ft. gas with a rock pressure of 960 lb. in 24 hours. Starting at 892 ft., the Corniferous lime was placed at 4,953 ft., Oriskany 5,066-5,101 ft., and gas 5,077-82 ft., total depth 5,101 ft.

New locations announced totaled 17 and were located in Boone, Braxton, Calhoun, Clay, Gilmer, Jackson, Kanawha, Lincoln, Marion, Putnam, Ritchie, Roane, and Wayne counties.

In South Beaver Township, Beaver County, Pennsylvania, Beaver Hill Oil & Gas Co.'s Oriskany test on the C. C. Kennedy farm, which has been shut down with the drilling tools, fishing tools and sand pump lost in the hole, will be abandoned. Starting from a surface elevation of 1,240 ft., the Onondaga was topped at 4,708 ft., or 51 ft. lower than the lowest well in a nearby Oriskany gas pool now exhausted. As water was known present in this pool, it is unlikely that the new test could have produced.

In Luzerne Township, Fayette County, Robert E. Murray et al completed a test on Thomas Rocks farm with a gage of 1,770,000 cu. ft. of gas from the Injun sand, topped at 1,794 ft.

New locations in southwest Pennsylvania totaled eight and were located in Arm-



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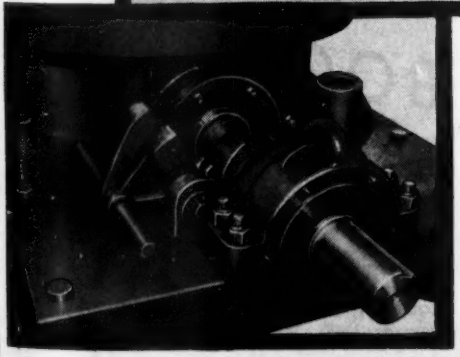

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BELOW: Locking pawl arrangement showing both pawls disengaged—guard removed.

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strong, Fayette, Greene, and Washington counties.

EASTERN TEXAS

Paluxy Sand Test Located In Northern Smith County

DALLAS.—A new Paluxy sand wildcat test for northern Smith County is G. A. Ritnour 1 C. S. Newellen, approximately 1 mile west of Lindale. It is contracted to 7,500 ft. and is on a 11.5-acre tract in the Thomas Burbridge Survey. A location for the new Mount Sylvan Paluxy pool of northwestern Smith County is the A. G. Hill and H. S. Moss 1 D. S. Foster. It is on 19-acre tract in the William Perkins Survey, 3½ miles southwest of Mount Sylvan.

Magnolia Petroleum Co. and Seaboard Oil Co. 1 S. L. Orr, R. B. Fowler Survey, discovery 3½ miles southwest of Avinger, Marion County, has installed pumping equipment and is ready for official test.

Hawkins field, Wood County, had six completions this week and Smithland field, Marion County, had two. Carthage field, Panola County, had four locations, Hawkins field had three and New Hope and Talco fields, Franklin County, each had one. Carthage field had 33 drilling wells, Hawkins field 19, New Hope field 7 and Sand Flat field, Smith County, and Calvert field, Robertson County, 4 each.

EASTERN TEXAS WILDCAT FAILURE

Navarro County: James E. Smith and P. J. Banks 1 S. S. Skinner, Peter Jackson Sur., 5 mi. SE Purdon, elev. 455 ft., Woodbine 2,294 ft., dry, TD 2,504 ft.

ILLINOIS

Concord Pool May Receive Westward Extension

MATTOON.—A west extension of the Concord pool, White County, was indicated last week when the W. R. Tuley & Delta Drilling Co. 1 Ramsey Community, NE NE NE 29-6s-10e, filled with oil at the rate of 300 ft. an hour from perforations opposite the McClosky lime at 3,001-06 ft. Previously, a 45-minute drill-stem test at 2,997-3,010 ft. showed 2,600 ft. of gas, 30 ft. of oil-cut mud and 120 ft. of mud-cut oil and salt water. A 1-hour drill-stem test of the McClosky at 3,030-35 ft. recovered 1,500 ft. of gas and 30 ft. of oil-cut mud. This well, bottomed at 3,038 ft., is now testing.

N. V. Duncan 1 Nannie Gibson, NW NW SE 2-4n-7e, discovery well of Lower O'Hara production in the Hoosier pool of Clay County, was completed during the past week for an initial production of 230 bbl. of oil daily, natural. Pay zone was at 2,892-2,902 ft. and the well was bottomed at 2,984 ft. This is the third well to be completed in this field, discovered only a few weeks ago. Other production is from the Cypress sand.

Sam Malis 1 John Williams, W½ SW NE 30-1s-6e, Wayne County wildcat, is waiting on cement with 5½-in. pipe set to 3,147 ft. Total depth of this well is 3,272 ft. Operators will shoot out pipe to test the Aux Vases at 3,044-68 ft.

In Hamilton County H. H. Weinert 1 Leo Hall, NE NW NW 29-3s-7e, is waiting on cement with 5½-in. casing set on bottom at 3,499 ft., to test the Aux Vases at 3,249-90 ft. and the Rosiclare at 3,335 ft. A 1-hour drill-stem test of the Aux Vases at 3,238-57 ft. recovered 360 ft. of oil, 300 ft. of oil-cut mud and 240 ft. of water, while another 1-hour drill-stem test at 3,325-42 ft. got gas in 55 minutes and 180 ft. of heavy oil-cut mud. A 30-minute drill-stem test at 3,398-3,415 ft. showed only 130 ft. of drilling mud.

Illinois operators reported 37 completions during the past week, 27 being oil wells and the remainder dry holes. Only five wildcat tests were completed and none of these was successful. First reports for the state totaled 29, and included only 4 wildcats, 1 each for Coles, Clinton, Franklin and Washington counties.

ILLINOIS WILDCAT FAILURES

Coles County: Perry Fulk et al 1 L. Z. Craig, NE NE NE 14-3n-9e, dry at 545 ft., Osage 520 ft.

K. M. Meyers 1 J. Phipps, SE SW SW 21-11n-9e, dry at 132 ft., no tops.

Hamilton County: William Cartmell et al 1 W. H. Johnson, NE SW NE 24-6s-7e, dry at 3,400 ft., Cypress sand 2,949 ft.

Richland County: Texas Co. 1 E. G. Ashmore, SW SW SE 11-4n-10e, dry at 3,172 ft., Glen Dean 2,485 ft., Golconda 2,568 ft., Cypress sand 2,676 ft., Paint Creek 2,886 ft., Benoist sand 2,891 ft., Renault 2,964 ft., Aux Vases sand 2,976 ft., Ste. Genevieve 3,020 ft., Fredonia 3,044 ft., McClosky 3,058 ft., St. Louis 3,167 ft.

Nash Redwine 1 N. A. Hall, SE SE SE 16-2n-10e, dry at 3,305 ft., Glen Dean 2,699 ft., Barlow 2,895 ft., Paint Creek 3,118 ft., Aux Vases 3,192 ft., Ste. Genevieve 3,242 ft., Fredonia 3,272 ft., McClosky 3,275 ft.

SOUTH LOUISIANA

New Deep Sand Opened by Bayou De La Fleur Field

NEW ORLEANS.—A new deep sand has been opened at Bayou de La Fleur field of Jefferson and Plaquemines parishes. The confirmation test is the California Co. 2 E. P. Brady et al, just northeast of the 1 Brady, discovery well, and is across the line in Plaquemines Parish, 34-16s-24e. Drilled to a total depth of 11,500 ft., with 5½-in. casing cemented to 10,491 ft., and perforated from 10,485-90 ft. this test flowed 260 bbl. of 36°-gravity oil daily through a 9/64-in. choke on initial produc-

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Recent advertisements of the MIDWEST OIL REGISTER in oil journals has caused confusion among many in the industry, who, noting the similarity in names, believe it to be connected in some way with the PETROLEUM REGISTER.

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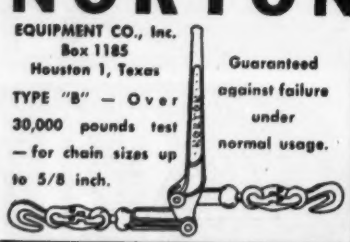

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tion gage. Flowing pressure on the tubing was 2,000 lb. Gas-oil ratio of 1,280 to 1, showing 0.1 per cent water cut.

Sun Oil Co. and Sohio Oil Co. added another producer to the Egan field of Acadia Parish with their 2-A J. R. Dailey, 30-9s-2w. The well is a high gas ratio well with a gage of 85 bbl. of 53°-gravity condensate daily through a 12/64-in. choke and a ratio of 21,475 to 1. Tubing pressure is 2,350 lb. Total depth is 10,650 ft. and 7-in. casing is cemented on the bottom with 32 perforations from 10,076-84 ft. for completion.

The Texas Co. 1-A Continental Land & Fur Co., 10-18s-15e, is a 13,000-ft. wildcat test in the Copasaw area of Terrebonne Parish. Operators have commenced operations and are drilling ahead from 2,871 ft.

In the Four League Bay area of Terrebonne Parish, Humble Oil & Refining Co. 1 Louisiana State, Lease 601, 4-20s-13e, is drilling below 13,000 ft., reporting shale at 13,122 ft.

Twenty new locations were reported this week, three being wildcats, one each in Beauregard, Cameron, and St. Mary parishes. Eight oil wells were completed in proven areas. One dry wildcat was reported in LaFourche Parish.

SOUTH LOUISIANA WILDCAT FAILURE

LaFourche Parish: Gulf Refg. Co. 14 Delta Securities Co., Inc., in Bully Camp area, 1-19s-20e, TD 7,897 ft., dry.

OKLAHOMA

Dewey County Wildcat Finds Gas Zone in Mississippi

OKLAHOMA NATURAL GAS CO. has reached the Mississippi lime in its Dewey County wildcat, 1 Oakwood Unit, NW NW NW 6-17n-14w, and reports indicate that the well developed considerable gas and began kicking when a core barrel was run. Work was suspended immediately, however, to weight the mud and take additional steps to keep the well under control before continuing.

Top of the Mississippi has not been definitely called but it is believed to be near 9,470 ft. The well was a few feet into the sand at 9,479½ ft. when it began kicking. The 1 Oakwood Unit is now at approximately the same depth as was Magnolia Petroleum Co. - Feikes, SW SW 31-18n-14w, when it discovered what looked like large gas and condensate production in 1940. Magnolia was forced to abandon its test, however, when the hole caved and buried some 6,300 ft. of drill pipe, and the productive possibilities were never definitely proved.

The Chitwood gas-distillate pool has been extended about 1 mile to the southeast by the Magnolia 1 Britt Unit, SE NW NW 3-4n-6w, Grady County. Casing was perforated with 90 shots at 10,408-37 ft. and with 96 shots at 10,959-92 ft., and a plug was set at 11,007 ft. to shut off lower perforations. The well tested at the rate of 17,000,000 cu. ft. of wet gas daily with casing pressure of 410 lb. and tubing pressure of 500 lb.

Charles P. Quinlan has the second producer in prospect in his recently discovered shallow pool southeast of Inola, Rogers County. The new well is the 2 Martin, NE SE SE 25-19n-16e, which had a good volume of gas and a spray of oil from the Bartlesville at 420-450 ft., total depth. The gas volume is heavier than in the discovery well and operators believe that if it is properly choked down to allow the oil to come in it will flow steadily. Operators also anticipate a major development program for the area.

Another outstanding development in the eastern Oklahoma area during the past week was the discovery of a deeper pay

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in the old Gregory pool of Okfuskee County by the W. A. Fleming et al 1 Powell, NW SW 30-10n-12e. Originally an old Gilcrease sand gas well at 2,660-70 ft., the 1 Powell, was cleaned out and deepened when the gas was exhausted. The Wapanucka-Cromwell was found at 2,985 ft. and 5½-in. casing was set on top of the sand. The well was then drilled out to 3,025 ft. and filled up with 800 ft. of oil. On swab tests it made between 20 and 25 bbl. of oil daily. Operators plan to deepen the well a few feet and then acidize.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Neustadt 1 Grant, NW NW NE 25-1n-1w, 1,000,000 cu. ft. gas from sand at 1,162-1,328 ft., TD 2,510 ft.

Hughes County: W. A. Delaney 1 Eckles, NW SW SE 16-6n-8e, 90 bbl. from Booch at 2,615-38 ft., TD 2,638 ft.

Pittsburgh County: Atlantic 1 Hill, NW NW NW 25-8n-18w, 3,910,000 cu. ft. gas from Angular sand at 6,150-6,235 ft., TD 6,500 ft.

Pottawatomie County: Carter 1 Thompson, NE SE 36-8n-4w, 420 bbl. from Hunton at 9,970-10 ft., TD 10,070 ft.

OKLAHOMA WILDCAT FAILURES

Creek County: C. E. Beal et al 1 Briggs, NW SW SW 27-19n-8e, dry at 3,348 ft., Woodford 3,348 ft.

Pontotoc County: J. R. Porter 1 Williams, NW NW NE 28-3n-7w, dry at 4,243 ft., sand at 4,135-60 ft.

Southwest Gas Co. 1 Zimmerman, SE NW NE 17-4n-8e, dry at 3,002 ft., Cromwell 2,972 ft.

Stephens County: Amerada 1 Paschall, NE NE SE 29-1s-5w, dry at 3,532 ft., T-Deese 3,080 ft.

Champlin 2 Henry, NE NE SW 13-2s-5w, dry at 900 ft., red beds 900 ft.

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KANSAS

McPherson County Wildcat Showing Oil and Gas

THE J. M. Huber Corp. 1 Sinclair, SW 25-19-1w, wildcat in McPherson County, completed as a dry hole in the Viola lime a year ago, is reported to be making 2,000,000 cu. ft. of gas a day and spraying oil. Production is from the chat at 2,890 ft. Production tests are yet to be made. The wildcat is 2 miles southeast of Canton and 1 mile north of the Bitikofer field.

Shows of oil in the Lansing logged at 3,352-58 ft., 3,363-72 ft., 3,436-38 ft., and 3,442-47 ft. are being tested at the Darby & Bothwell, Inc., 1 Husted "B," NE SE SW 11-10-19w, Rooks County. If the well is successfully completed, it will extend the Vohs pool one location to the west.

Kansas reported 39 completions of which 6 wildcats were dry. Of the 33 field wells completed, 20 made oil with a total initial production of 5,444 bbl., 4 made gas, and 9 were dry.

KANSAS WILDCAT FAILURES

Ellis County: Phil-Han Oil Co. et al 1 Humburg, NW NW NE 4-12-20w, dry at 3,887 ft., Arbuckle 3,889 ft.

Ford County: E. M. Swearer 1 Brown, SW SW SW 4-26-23w, dry at 2,915 ft., Fort Riley 2,721 ft.

Pawnee County: Campbell & Kuhn 1 Keeley, NE NE NW -9-21-15w, dry at 3,781 ft., Arbuckle 3,750 ft.

Rice County: Sharon Drilling Co. et al 1 Leatherman, NE SE SE 35-21-9w, dry at 3,788 ft., Viola chert 3,622 ft.

Rush County: Darby & Bothwell and Iron Drilling Co. 1 Ficken, NE NE SE 33-17-17w, dry at 3,598 ft., granite 3,594 ft.

Stafford County: W. P. Faulkner 1 Fischer, E/2 NW NE 8-21-13w, dry at 3,625 ft., Arbuckle 3,590 ft.

MISSISSIPPI

Wilkinson County Wildcat Coring Below 11,000 Ft.

JACKSON.—An oil show in a thin sand streak at 11,079-81 ft. in the upper portion of the lower Tuscaloosa, was recovered in a core at the Danciger Oil & Refining Co. 1 George W. Armstrong, 660 ft. south of north line and 660 ft. west at right angle to east line in 5-4n-2w, wildcat in Wilkinson County. Another show was noted at 11,164-69 ft. However, the slightly porous sand at 11,123-26 ft. and 11,191-11,203 ft. had no oil shows. Operators are coring below 11,203 ft. The Selma was topped at 9,438 ft., Austin at 9,924 ft. and base Austin at 10,302 ft.

The Magnolia Petroleum Co. 3 Ruth B. Pidgeon, 330 ft. north and east of SW cor. 26-17n-4e, in Kings field, Warren County, was completed as dry. The discovery well, 2 Pidgeon, and one other well, the Magnolia Petroleum Co. 1 Finlay, are both gas producers in the pool. The productive sand zone at the 2 Pidgeon and 1 Finlay had slight gas odor in the 3 Pidgeon but was poorly developed from 1,962-2,013 ft. The 3 Pidgeon was 78 ft. higher structurally than the discovery well and 116 ft. lower than the 1 Finlay.

Mississippi reported three completions. The Clarke County wildcat was dry. Heidelberg field, East, added one producer with an initial production of 149 bbl. The Magnolia Petroleum Co. 1 S. D. Finlay in Kings field was completed as a dry gas well.

MISSISSIPPI WILDCAT FAILURE

Clarke County: Sun Oil Co. 1 Long Bell Petroleum Co., 534 ft. south and 413

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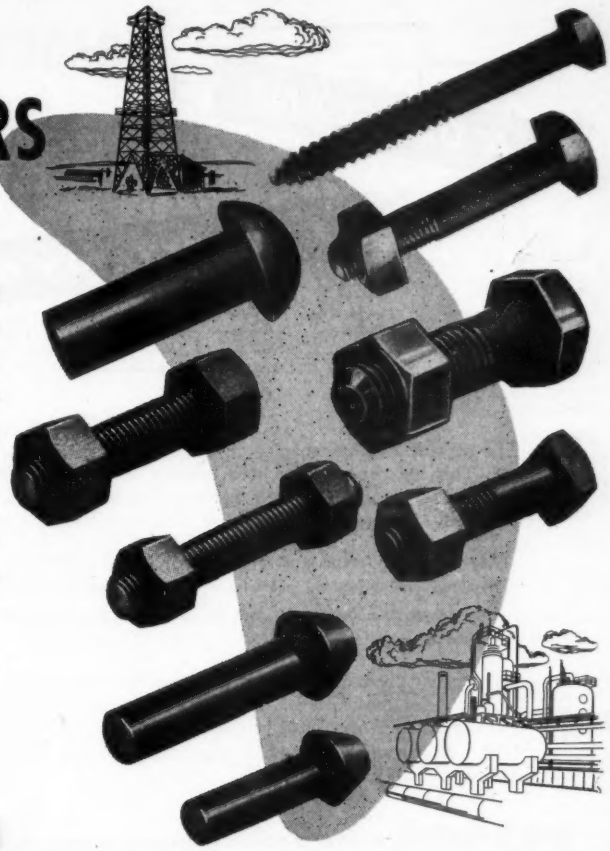

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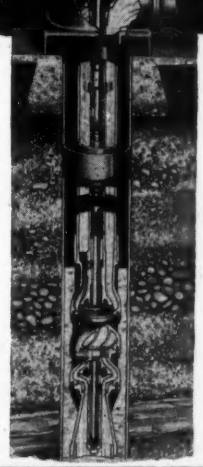

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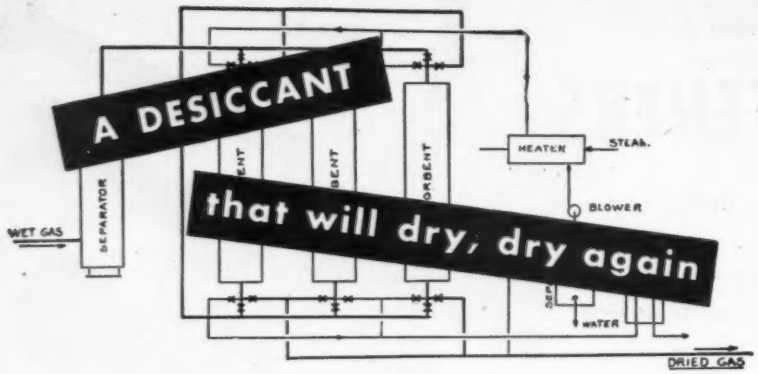

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GEORGIA WILDCAT FAILURE

Montgomery County: James E. Weatherford 1 H. Wilkes, unsurveyed area, about ½ mile west of Higgston, Georgia, dry at 3,433 ft.

OHIO, KENTUCKY

Sayre Gas Pool Extended In Southwest Direction

COLUMBUS.—B. G. Davis 1 Ray Penrod, Section 22, Bearfield Township, Perry County, has extended the Sayre pool 1 mile in a southwesterly direction. The Clinton sand at 3,805-37 ft. gaged 200,000 cu. ft., and Medina sand at 3,890-96 ft. gaged 230,000 cu. ft. A west offset to the well will be drilled soon.

Mehowa O. & G. 1-C R. V. Buren, Lot 9, Clark Township, Coshocton County, gaged 854,000 cu. ft. in the Red Clinton at 3448-65 ft. The well is located ½ mile west of the Layland oil pool.

Ohio Fuel 1 Jas. E. Madden, Section 21, Madison Township, Perry County, was shot and flowed 85 bbl. in 24 hours. In Clayton Township, Perry County, Preston Oil 2 Cookson-Adrian, Section 3, made 28 bbl. after shot and 220,000 cu. ft. gas.

Twenty-two locations were reported for the week. Lancaster led with seven followed by Mt. Vernon and Sandyville with four each and Ashland with three. Ashland had 6 of the 22 completions.

OHIO WILDCAT FAILURE

Trumbull County, Vernon Township: Hickman & Hart 1 E. & O. Hipkins, Lot 6, Clinton 4,665-4,833 ft., TD 4,845 ft. dry.

EASTERN KENTUCKY

ASHLAND.—Activity in eastern Kentucky during the past week was highlighted by the well completion on the Clay Martin property in Knott County by Kentucky-West Virginia Gas Co. The well was shot at 1,525 ft. in Big lime, with a daily open flow of 1,391,000 cu. ft. of gas.

Kentucky-West Virginia Gas Co. also completed No. 5651 on the Carlisle Lands in Martin County, total depth 526 ft., with an open flow of 286,000 cu. ft. in Salt sand.

WESTERN KENTUCKY

OWENSBORO.—The Hoosier Drilling Co. is assembling a rotary rig for the 1-D C. A. Dempewolf, NE NE NE 18-P-27, Henderson County. This well, located near the center of the Birk City pool, will be the first deep test to be drilled in this pool. It is expected to go to the Devonian which is estimated at about 3,250 ft.

Rotary tools are also being moved in for a wildcat test in 2-O-21, Union County. The well is the Sun Oil Co. 1 T. E. Willett and M. L. Byrne. It is located in the northwest corner of the farm.

A drop in completions was noted in the western Kentucky area during the past week with only three wells reported, all oil wells. No wildcat completions were reported. New operations totaled four, including three for Henderson County and one for Union County.

INDIANA

EVANSVILLE.—Rotary tools are being moved in for a wildcat test midway between the Heusler and Caborn fields of Posey County. The new well is the F. J. Fleming and A. K. Swann 1 John Hartman, NW NW SE 27-6s-12w, which is scheduled to go to the McClosky lime expected at about 2,750 ft.

Continental Oil Co.'s deep test in the Griffin pool, 1-D Cooper estate, SW SW

13-3s-14w, is shut down at 4,147 ft. due to flood waters from the Wabash River. The Devonian is the next main horizon and is expected at about 4,500 ft.

Only two oil wells and three dry holes were reported completed in Indiana during the past week. None were wildcats. Five new operations were reported, four in Gibson County and one in Posey County.

LA.-ARK.

Halbouty Discovery Opens Red River Parish Pool

SHREVEPORT.—A shallow oil pool has been opened in the North Louisiana area by the successful completion of the Michel T. Halbouty 1 Willie Savill, NE NE 36-11n-10w, on the south flank of the Bull Bayou area of Red River Parish. Initial production was 35 bbl. of 45° oil in 24 hours from the Nacatoch sand, Upper Cretaceous, at 1,207-28 ft. The well was drilled to a total depth of 1,260 ft. Two offsets have been started.

A second oil well for the Ashland area in Natchitoches Parish appears assured with a drill-stem test in sand at 3,296-3,312 ft. recovering 720 ft. of 25°-gravity oil at the California 2 Halbouty-Detro, 1-13n-8w.

Salt water and some oil was swabbed at 2,931 ft. at the T. W. Murray and Garland Anthony 1 Beck, SE SE 33-15s-26w, Garland City pool, Miller County, Arkansas. The hole was drilled to 2,960 ft. and casing set at 2,931 ft. Operators are plugging back to 2,942 ft.

Testing is in progress at the K. E. Merren 1 James D. Shaver, Jr., SW SW 36-12s-31w, wildcat in Little River County. The hole has been drilled to 3,000 ft.

Operators are drilling below 5,400 ft. in hole sidetracked at 3,250 ft. at the Arkansas-Oklahoma Gas 1 N. C. Biggs, NE NE NW 7-7n-27w, wildcat in Logan County.

North Louisiana reported 14 completions with 1 successful wildcat and 2 failures. Of the 11 field wells completed, 5 made oil, 2 gas and 4 were dry.

Arkansas had three completions with one successful wildcat and one wildcat

(Continued on page 131)

LEGAL

Notice is hereby given that on Wednesday, June 19, 1946, at 2:00 P.M. in the Knotty Pine Room in the basement of the Farmers & Bankers Life Building, Wichita, Kansas, there will be sold at public action to the highest bidder for cash, oil and gas royalty interests and reservations consisting of 3262 royalty acres participating and 1860 royalty acres non-participating. These are located in Barber, Ellis, Gove, Logan, Rooks, Sherman, Thomas, Trego and Wallace Counties, Kansas.

Bids will be received on the various tracts separately and all of said tracts collectively. Sale will be made either in individual tracts or collectively, whichever way the bids are the highest.

Complete information showing the description number of royalty acres in each tract, the date of expiration of royalty interests and whether participating or not will be mailed upon request to the undersigned address.

If unable to attend this sale, you may submit sealed bids either on the individual tracts or collectively. All sealed bids must be accompanied by certified check or bank draft payable to the undersigned for at least ten per cent of the amount of the bid, balance to be paid upon notice of acceptance of bids and delivery of proper conveyance by the undersigned.

All successful bidders at the auction will be required to deposit ten per cent of their bids and pay balance upon delivery to them of proper conveyance by the undersigned.

T. M. Lillard and W. D. Jochems, Receivers of the Wheat Farming Company, 305 Farmers & Bankers Life Building, Wichita, Kansas.

CALENDAR

June

Society of Automotive Engineers, semi-annual meeting, French Lick, Ind., June 2-7.

American Gas Association, gas production and chemical committees, joint conference, Hotel Pennsylvania, New York, June 3-5.

American Gas Association, southwest conference, Blackstone Hotel, Fort Worth, June 4.

Houston Nomads, River Oaks Country Club, June 4.

Pennsylvania Oil Producers Association, Bradford district, fifteenth annual meeting, Pennhills Club, Bradford, Pa., June 6.

A.P.I. division of production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, June 6-7.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette, Lexington, June 7-8.

Los Angeles Nomads, Mayfair Hotel, June 12.

American Society of Mechanical Engineers, oil and gas power division, eighteenth national conference, Hotel Schroeder, Milwaukee, Wis., June 12-15.

A.P.I. division of production, spring meeting, William Penn Hotel, Pittsburgh, June 13-14.

Federal Power Commission hearing in the natural-gas industry investigation, Washington, June 17.

Canadian Gas Association, thirty-ninth annual convention, Murray Bay, Que., June 17-19.

Western Petroleum Refiners Association, second postwar regional technical meeting, Olds Hotel, Lansing, Mich., June 20.

Southern California Meter Association, Annual Low Jinks and June meeting, Rio Hondo Country Club, Downey, Calif., June 20.

American Society for Testing Materials annual meeting, Buffalo, June 24-28.

Pennsylvania Grade Crude Oil Association, twenty-third annual meeting, William Penn Hotel, Pittsburgh, June 27-28.

July

Houston Nomads, River Oaks Country Club, July 2.

Los Angeles Nomads, annual meeting and party, Mayfair Hotel, July 10.

August

Houston Nomads, River Oaks Country Club, August 6.

Interstate Oil Compact Commission, quarterly meeting, August 8-10, Grand Rapids, Mich.

American Institute of Chemical Engineers, western convention, Palace Hotel, San Francisco, August 25-28.

September

Houston Nomads, River Oaks Country Club, September 3.

Sixth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., September 9-11.

American Chemical Society, semiannual meeting, Chicago, September 9 to 13.

Fourth National Chemical Exposition, sponsored by Chicago section, American Chemical Society, Coliseum, Chicago, September 10-14.

Los Angeles Nomads, Mayfair Hotel, September 11.

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

National Petroleum Association, forty-fourth annual meeting, Hotel Traymore, Atlantic City, N. J., September 18-20.

October

American Association of Oilwell Drilling Contractors, sixth annual meeting, Plaza Hotel, San Antonio, Tex., October 1-2.

American Institute of Mining and Metallurigal Engineers, Petroleum Division, annual meeting, Galvez Hotel, Galveston, Tex., October 3-5.

Houston Nomads, River Oaks Country Club, October 8.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18.

American Institute of Mining and Metallurical Engineers, Petroleum Division, annual meeting, Ambassador Hotel, Los Angeles, October 24-25.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

November

Houston Nomads, River Oaks Country Club, November 5.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

December

American Society of Mechanical Engineers, New York, December 2-6.

Houston Nomads, River Oaks Country Club, December 3.

Los Angeles Nomads, Mayfair Hotel, December 11.

1947

January

Society of Automotive Engineers, annual meeting and engineering display, Book-Cadillac Hotel, Detroit, January 6-10.

May

International Petroleum Exposition, Tulsa, May 17-24.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington 25, D. C. Notice is hereby given that sealed bids will be received until noon on Wednesday, June 5, 1946, for land described herein situated within the known geologic structure of the Big Polecat oil and gas field, Wyoming. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U. S. C. sec. 226), in the following parcels: All in T. 57 N., R. 98 W., 6th P.M.: Parcel No. 1, sec. 21, NW¼NW¼, 40 acres. Parcel No. 2, sec. 21, SE¼NW¼, 40 acres. Parcel No. 3, sec. 22, SW¼NW¼, 40 acres. Parcel No. 4, sec. 34, N½NE¼NW¼, SW¼NE¼NW¼, SE½SE¼NW¼. Tract 9, 54.01 acres. Total 174.01 acres. Bids must be submitted on each parcel separately; but if two or more parcels are awarded to the same bidder, they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked, "Bid for Parcel No. .., Big Polecat oil and gas field, Wyoming. Not to be opened before noon, June 5, 1946." No bids received after the hour fixed herein for submitting bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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Among the Drilling Contractors

Mendenhall Drilling Co. has completed a successful producer in Greenwood County, Kansas, for Mid-Continent Petroleum Co. The well is the 25 Wayham in SE SW SE 14-24s-12e.

Olsen-Blount Drilling Corp. is testing at a total depth of 7,001 ft. at the Stanolind Oil & Gas Co. B-1 Repogle in SW SW 27-13n-4w, Oklahoma County, Oklahoma. Same contractor is drilling at 340 ft. at the R. Olsen Oil Co. 2 Boyd in SW SE NE 23-22s-37e, in the Penrose-Skelly pool, Lea County, New Mexico.

General Petroleums of Calgary, Alta., is drilling two wells for Bata Petroleums in the Vera-Unity field of western Saskatchewan.

Canokla Drillers of Edmonton, Alta., are preparing to resume operations from 435 ft. on the Kitalta Oils 1, LSD 5, 20-55-20w4, near Edmonton. Work has been suspended since last December pending delivery of a gasoline power unit. Standard tools are being used.

Nelson Drilling Co. held the contract at the Westgate-Greenland Oil Co. 2 Blessing in SE SE SE 27-17s-1w, Crowther pool, McPherson County, Kansas.

Union Drilling Co. of Calgary, active for some years in the contracting field in Alberta, is moving equipment for a test for Baxter Lake Oils in LSD 12, 20-46-5w4 in the Baxter Lake area near Wainwright.

Falcon-Seaboard Drilling Co. has moved in material for a Wilcox test at the Irwin Miller 1 Williams in NE SW NW 35-12n-6e, Lincoln County, Oklahoma.

Ferrier Drilling Co. drilled the York State Oil 1 Bemis "B" in E½ SE NW 33-11s-17w, Ellis County, Kansas.

Perry, Busk & Ormiston Drilling Co. will drill a wildcat in Allegan County, Michigan, for Superior Oil Co. The well is the 1 Fred & Gail M. Shafer in SW SE SE 35-1n-12w.

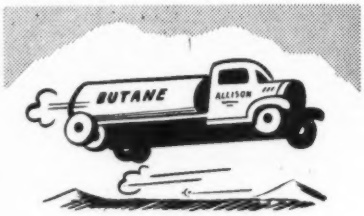
Noble Drilling Co. held the contract at the California Co. discovery well in Love County, Oklahoma. The well is the 1 Wright in NE NW 13-8s-1w.

Veeder Drilling Co. completed the 1 Ostlund for A. W. Ault et al in NE NW SE 10-19s-2w, Ritz-Canton pool, McPherson County, Kansas.

K de K Drilling Co. of Vermilion, Alta., is drilling the Marina 2, LSD 9, 27-49-1w4, in the Alberta end of the Lloydminster field.

Ryan Drilling Co. was the contractor at the George Reeves 3 Haley in NE SE NE 13-26-12w, Stark pool, Pratt County, Kansas.

Stinson Drilling Co. is assembling a new rotary rig for a deep test at the Hoosier Drilling Co. 1D C. A.



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Dempewold in NE NE NE 18-P-27, Henderson County, Kentucky.

Peel Drilling Co. drilled the 1 Siemsen in NE NE NE 24-16s-14w, for Derby Oil Co. et al in the Trapp field, Barton County, Kansas.

Lyle Cashion Drilling Co. holds the contract at the Gulf Refining Co. 1 State in SW 2-67s-29e, Monroe County wildcat in Florida.

Harbar Drilling Co. was the contractor at the E. M. Swearer 1 Brown in SW SW SW 4-26-23w, Ford County, Kansas.

Penrod Drilling Co. is drilling surface hole at the Union Producing Co. A-1 Cameron in NE NW 2-9n-1e, Madison County, Mississippi.

Jack Caudle Drilling Co. will drill the Milton Lobree 1 Essie Stewart in SE NE 22-1n-9w, Pike County, Indiana.

Campbell Drilling Co. completed the 1 Fischer for W. P. Faulkner in E½ NW NE 8-21s-13w, Stafford County, Kansas.

Jeff Dye Drilling Co. is coring at 7,426 ft. at the Ohio Oil Co. 1 Hernasco Corp. in NW 19-23s-18e, wildcat in Hernando County, Florida.

Rex & Morris Drilling Co. held the contract at the R. H. Shields 1 Sluss in NE NE NE 26-26s-5e, Butler County, Kansas.

Lincoln Drilling Co. will drill the George G. Hanners 1 H. Lang in SW SE NW 11-22n-10w, Wexford County, Michigan.

La.-Ark. Fields

(Continued from page 129)

failure. The one field well completed was in Village with an initial production of 80 bbl. and drilled to a total depth of 7,426 ft.

ARKANSAS SUCCESSFUL WILDCAT

Nevada County: Charles F. Steele et al 1 H. L. Waters, N½ NW NE 20-14s-21w, 20 bbl. from Nacatoch at 1,207-18 ft., TD 2,263 ft.

ARKANSAS WILDCAT FAILURE

Lonoke County: G. D. Howell, Tr. 1 G. Barnwell, 400 ft. north and 300 ft. east of southwest corner of 18-3n-9w, dry at 1,765 ft.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Caddo Parish: Union Producing Co. A-1 Nool Estate, 667 ft north and east of southwest corner of 11-19n-16w, 8 bbl. from Travis Peak at 5,697-5,710 ft., TD 9,239 ft.

NORTH LOUISIANA WILDCAT FAILURES

Franklin Parish: Cherry-Kidd Co. 1 J. J. Archibald, 544 ft. north and 533 ft. west of southeast corner of NE NW, 29-16n-7e, dry at 3,420 ft.

Richland Parish: R. L. Fisher et al 1 V. Koener, 2,310 ft. south and 338 ft. east of northwest corner of 36-16n-5e, dry at 4,502 ft.

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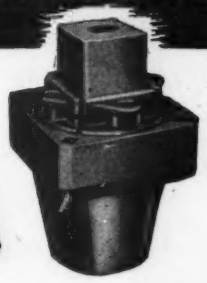

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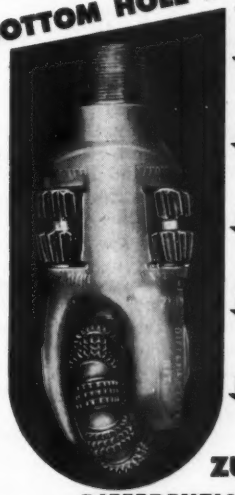

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PERSONALS

GLENN F. BISH

Bish Made Manager In Mid-Continent For Ohio Oil

THE appointment of Glenn F. Bish as manager in charge of Mid-Continent operations for Ohio Oil Co., succeeding W. W. Fleming, was announced last week following a meeting of the company board of directors.

Bish, a native of Ohio, attended the University of Texas. He joined the company in 1924 and worked his way up from a roustabout job in the oil fields of Louisiana.

In 1926 he was transferred to the geological and land departments, handling Wyoming and New Mexico. In 1930 he was advanced to production foreman in Hobbs field and 5 years later was made district superintendent.

In May 1940 Bish was promoted to division superintendent of production with offices at Houston. Later he was transferred in the same capacity to Michigan where, in 1942, he was made assistant division manager and then division manager for the state with headquarters at Grand Rapids where he remained until coming to Tulsa.

Fleming has been connected with Ohio Oil Co. for more than 36 years. He also climbed the ladder from a roustabout's job in the oil fields of Ohio, Indiana, and Illinois to vice president and a director in Tulsa, a position he held until his recent resignation.

Paul L. Guarin, who before entering the Army was assistant production manager in the Texas-Gulf area for Shell Oil Co., Inc., has returned to the company as a special assistant to the vice president in the administrative department. Guarin, a lieutenant colonel, during the war was assigned to work connected with the atomic bomb development. Other Texas-Gulf area Shell personnel who have returned to the company after military service: **James W. Hunt,** assistant valuation engineer, Shell Pipe Line Corp., Houston office; **Robert R. Brown,** mechanical engineer, at Houma, La.; **Herbert M. Goodman,** geologist at San Antonio; **Richard B. Hale,** assistant seismologist, exploration department, Houston; **Charles A. Stuart,** junior exploitation engineer at Houston; **Gordon W. Heid,** senior area geologist at Houston; **William H. Wallace,** junior stratigrapher, exploration department, Houston; **Fred B. Loomis, Jr.,** subsurface geologist, exploration department, Houston; and **Tempest M. Ocheltree, Jr.,** exploitation engineer.

Francis O. McKeany who has been chief dispatcher in the Los Angeles office of Shell Oil Co., Inc., has been promoted to superintendent of oil movements, pipe line division, and will retain offices at the Los Angeles headquarters of the company.

Austin Cadle has been appointed head of the petroleum economics department of Standard Oil Co. of California and will maintain offices at the headquarters of the company in San Francisco. Cadle, who recently returned from military service, succeeds **Earl Wagy** who recently retired.

Harold Saueressig who has been associated with The Texas Co. in its California operations and with Southern California Gas Co. in its butadiene production department, has joined the Honolulu Gas Co. as plant engineer. His duties will include general engineering and operating supervision of the company's gas plant which supplies manufactured gas for the city of Honolulu.

Herbert Rothstein, assistant vice president of Bell Oil & Gas Co., Tulsa, has assumed the duties of secretary following the resignation of **Ben P. Piepgrass,** effective June 1. Piepgrass has been connected with Bell and affiliated companies for more than 15 years and for the past several years was secretary and assistant treasurer. He will devote his entire time to personal interests. Other Bell changes include **Joel P. Dyer,** who assumes the duties of comptroller.

James D. Wheeler last week was promoted to division manager for Ohio Oil Co., at Grand Rapids. Wheeler joined Ohio Oil as a petroleum engineer in 1932 and progressed

J. D. WHEELER

D. R. WILLIAMS

to division petroleum engineer with headquarters in Tulsa and later, in Houston. In 1941 he was made chief petroleum engineer and assigned to the general offices at Findlay, Ohio **Denver R. Williams** at the same time was appointed assistant to the manager of the crude-oil purchase and sales department of Ohio Oil Co. at Findlay. Williams started with the company in 1926 as a clerk and in 1941 was named executive secretary of the crude-oil sales department.

Andre Blanchard, president, and **E. L. Dalemont,** director, of D'Achat des Carburants, have been visiting in Houston, Tulsa, and other southwestern points in connection with the purchase of petroleum products for France. Dalemont is located in New York.

Reid W. Bond, production manager in Tulsa for Shell Oil Co., Inc., until he joined the Army in 1942, has been assigned to the company's Houston office to fill the newly-created job of director of production on the staff of the vice president in charge of operations east of the Rockies. Bond will coordinate production activities of both the Tulsa and Houston offices.

L. G. Christie, area geologist for the Jackson, Tallahassee, and Baltimore districts of Shell Oil Co., Inc., has been transferred to the president's office in New York. **Dr. W. W. Rand,**

formerly district geologist for Tallahassee, has succeeded Christie as area geologist.

G. S. Maddox, Carter Oil Co., has been elected president of the Oklahoma City Geological Society. **Harold Kleen,** Skelly Oil Co., was chosen vice president, and **Frederick Kate,** Shell Oil Co., Inc., secretary-treasurer.

J. C. Hamilton, Shreveport, has been named vice president in charge of rates and valuations for Arkansas Louisiana Gas Co. Hamilton has been head of the rate and valuation department and assistant secretary of the Arkansas Louisiana company for a number of years and has been with the organization for the past 27 years.

Bruce A. McCandless and **Thomas S. Leitch** have returned to the American Gas Association testing laboratories at Cleveland after 5 years' service in the field artillery. Each was a lieutenant colonel at time of separation.

D. E. Simic, Cities Service Oil Co., was elected president of the North Texas Geological Society at its annual meeting in Wichita Falls, Tex. **L. L. Harden,** Sinclair Prairie Oil Co., was elected vice president, and **Turner Wynn,** Stanolind Oil & Gas Co., secretary-treasurer.

Samuel O. Sorenson, Minneapolis, Minn., was elected president of the American Oil Chemists Society at its New Orleans meeting.

Harry B. Kniseley, Carter Oil Co. public relations department, has been elected a vice president of the National Council of Industrial Editors. Kniseley is editor of The Link, Carter's house organ.

Paul Montgomery has been named acting Louisiana state geologist succeeding **Dr. John Huner** who resigned to enter private consultation work. Montgomery was granted a leave from his work as gas engineer under the state director of natural gas conservation.

John B. Burningham and **Norman Melluish,** both of Arthur Brown & Co., Ltd., London, England, and **Roger King,** Abco Petroleum Co., Paris, France, were recent visitors in Tulsa.

Raymond Shaw, president of Chek-Chart Corp., Chicago, has received a Certificate of Appreciation from Army Ordnance Department for wartime service in inaugurating lubrication programs on materiel and for advising field personnel and headquarters in such matters.

Leslie Forster, formerly connected with the wartime Office of the British Petroleum Representative in Washington, is slated to become general manager of Compania de Petroleo Shell Colombia. Among Forster's other war activities was his aid in the destruction of Burma oil fields before the Japanese arrived. **H. S. M. Burns,** his predecessor, will go to California as vice president of Shell Oil Co., Inc.

Dr. R. T. Goodwin, manager of the aviation department of Shell Oil Co., Inc., in New York, has returned from a 7 weeks' flying trip through Central and South America. He visited 22 countries and covered 15,273 miles.

M. L. Haider, formerly executive assistant of production for Standard Oil Co. (New Jersey), is now production manager of Imperial Oil, Ltd. No replacement has yet been made in the Jersey vacated job. The Imperial position is a newly-created post.

Alexander Hannah, K. C. has been elected president of Royalite Oil Co., Calgary, Alta., succeeding **P. F. Shannon,** recently transferred to New York. Other officers are: vice president and managing director, **S. F. Heard;** vice president, **K. H. Houston;** directors, **Dr. O. B. Hopkins, N. J. Christie,** and **A. C. Newton.**

Dr. T. B. Williams, active as a geologist for many years in western Canada, has been appointed petroleum and gas commissioner for British Columbia. Dr. Williams supervised the British Columbia Government's drilling program at Commotion Creek some years ago.

Gerald G. Roberts, Midland, Tex., will move to San Antonio to become head of a new district geological and land office being opened there by Great Lakes Carbon Co.

A. W. Billings was elected president of Signal Petroleum Co. at the annual meeting and **Lyle Garner** was elected vice president. **Harry Clarke, L. L. Henninger,** and **James C. Bransford** were elected directors.

Dr. George W. White has succeeded **Dr. Wilber Stout** as state geologist for Ohio. Dr. White was previously professor at the University of Tennessee and University of New Hampshire. Dr. Stout, state geologist for the past 18 years, will devote part of his time to lecturing at the Ohio State University.

William H. Allen has returned to his prewar job as geologist in the Midland, Tex., office of Shell Oil Co., Inc. Allen was a major in the Seventh Infantry Division.

Edwin J. Glocke, former general auditor of Socony-Vacuum Oil Co., Inc., has been appointed assistant comptroller of the company.

William C. Ziegenfus has been made full-time recreational director at the Marcus Hook, Pa., refinery of Sun Oil Co. Ziegenfus formerly was athletic director at Swarthmore, Pa., High School.

A. F. Driskill, drilling superintendent for Iraq Petroleum Co., Ltd., will return shortly to Kirkuk, Iraq, after a 5 months' vacation in the United States. Driskill has spent the last 19 years in the Middle East.

Fred Manyluk, petroleum engineer, has been stationed in the Vermilion field of Alberta as oil field inspector for the Petroleum and Natural Gas Conservation Board of Alberta.

G. Russell Sparenberg has joined Houston Natural Gas Corp. as a geologist in the production department. Sparenberg was recently released as a Navy lieutenant.

Dr. A. Camacho, Colombia's minister of oil, resigned his cabinet post recently to participate in behalf of **Presidential Candidate G. Turbay. Dr. Carlos de Mendoza,** consulting lawyer to the presidency, was named to fill the post.

H. E. Giles, of Union Oil Co., has succeeded **S. H. Grinnell** as superintendent of service and maintenance. Grinnell resigned after 28 years of service with Union to accept a position with Pacific Airmotive Corp.

T. C. Williams, recently released from the Army Air Forces, has rejoined the Texas Railroad Commission as petroleum engineer in the Midland office.

Ivan R. Cunningham, Creole Petroleum Corp.; **George L. Duwe,** Cameron Iron Works, Inc.; and **Birnie V. Edridge,** Bovaird & Seyfang Manufacturing Co., have been elected by the Controllers Institute of America as petroleum industry members.

A. D. Gulde, geologist with Pure Oil Co. at Carmi, Ill., has resigned to become an independent operator.

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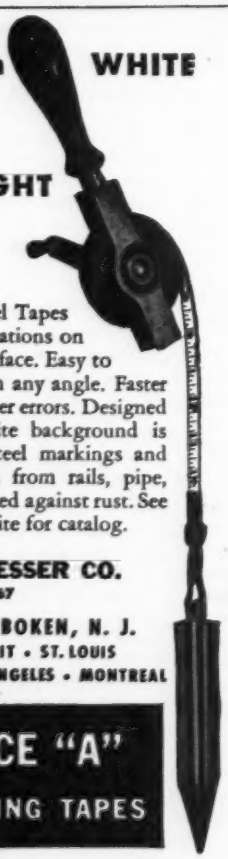
BLACK on WHITE
for
BETTER SIGHT



WYTEFACE "A" Steel Tapes have *raised* black graduations on a crack-proof white surface. Easy to read in any light, from any angle. Faster measurements with fewer errors. Designed for hard service. White background is protected by raised steel markings and rims. Resists abrasion from rails, pipe, rocks, concrete. Protected against rust. See your supply house. Write for catalog.

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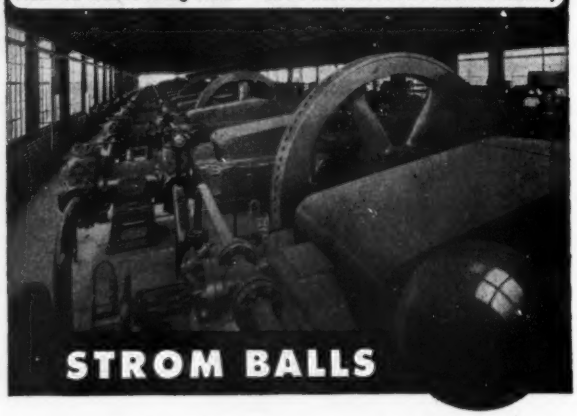
Drafting Reproduction Surveying Equipment and Materials Slide Rules Measuring Tapes

WYTEFACE "A"
STEEL GAUGING TAPES

From Oil Well to Filling Station—Strom Balls Serve the Petroleum Industry



...a Shield Against Friction

(in Natural Gasoline Plants)

Reducing frictional resistance in equipment for Natural Gasoline Plants—such as electric motors, gas engine compressors, pumps and instruments—Strom Balls are aiding in the reconversion race to smooth-operating production. Write for catalog. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Ill.

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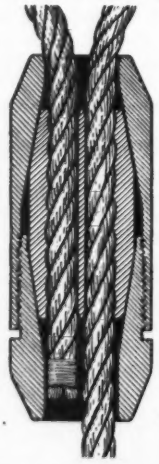
Strom BALLS Serve Industry

LOOK INTO...

Cabl-ox

THE NEW WIRE ROPE CLAMP
That Really Holds the Line!



CABL-OX clamps work on a brand new wedging principle. Holding power increases with the load and exceeds tensile strength of rope used. Does not crush and weaken rope like old style U-clips. Assembly is fast, neat . . . saves breakdowns, equipment, injuries and expense. Can be used over and over. Cadmium plated.

Cabl-ox

Made in all sizes from ⅛" to ¾". For all wire rope applications.

• FASTER • SURER • SAFER
• STRONGER • ECONOMICAL

Ask your distributor or write for illustrated folder and prices.

NUNN MANUFACTURING COMPANY
2125 Dewey Avenue, Evanston, Illinois

Equipment Men in the News

Flanders Joins Lane-Wells; Wright Returns

G. S. FLANDERS

George S. Flanders has joined Lane-Wells as export sales engineer, according to James D. Hughes, Lane-Wells sales manager. Flanders was active in oil-tool export work before the war and had headquarters in Trinidad and New York City. Flanders in his new capacity will headquarter in Los Angeles.

James C. Wright, for the past 4 years on military leave of absence from Lane-Wells, has returned as district sales engineer in Houma, La.

Valentine Appointed Chief Engineer of Sterling Engine Co.

B. Gordon Valentine, designer of gasoline and diesel engines, has been appointed chief engineer of Sterling Engine Co., Buffalo. Prior to joining Sterling September 1945, Valentine had been employed by William Beardmore & Co., Scotland, Bethlehem Shipbuilding Corp., Ingersoll-Rand Co., Cooper-Bessemer Corp., and John Deere Tractor Co.

Sterling Engine also announces opening of a direct factory branch in San Francisco. Hans Bohuslav, vice president and director of Sterling's engineering development and research, will be in direct charge of the new factory branch. He will be assisted by Al Hahn, Navy commander during the war, who has now joined the Sterling organization. Both Bohuslav and Hahn are well-known engine specialists having been associated for many years in engine development and service work on the West Coast.

Humphrey Joins Oil Well Supply Co.

R. L. Humphrey, formerly business manager of the magazine Drilling, has been released from active duty in the Army and is now tubular representative in the Gulf Coast division of Oil Well Supply Co.

R. W. McClenahan Advanced To Vice Presidency

American Meter Co. has announced election of Col. R. W. McClenahan as a vice president. Colonel McClenahan returned to the company after his discharge from the U. S. Army Air Forces in November 1945. He has been active since that time working on special assignments.

Falcon Products Co. Acquired By Loud and Schlittler

Republic Supply Co. of California announces the sale of Falcon Products, Inc., to A. R. Loud and H. F. Schlittler, vice president of the company. Loud is the owner of H. W. Loud Machine Works of Pomona, Calif., and will become president of Falcon Products, Inc., which will continue under the management of H. F. Schlittler as vice president and general manager.

Headquarters of the company will be removed from Los Angeles to 969 East Second Street, Pomona, as soon as additional office and warehouse facilities can be provided.

O'Shea Retires as Board Chairman

Benjamin O'Shea has retired as chairman of the board of directors of Union Carbide & Carbon Corp. He will continue as a director and a member of the executive committee. The office of chairman of the board has been abolished with O'Shea's retirement.

Foster to Represent Hammond Iron Works

Appointment of D. D. Foster Co., 412 People's Gas Building, Pittsburgh, as Pittsburgh district representative, has been announced by Hammond Iron Works, Warren, Pa.

Western Gear Advances Two

Western Gear Works announces the recent advancement of Lee A. Guttero and Eugene Miller to handle the sales and service of their Pacific pumping units, Pacific-Western speed reducers and other oil-field equipment. Guttero serves the Los Angeles and Southern Basin area, and Miller the San Joaquin and coastal areas.

LEE A. GUTTERO

EUGENE MILLER

Thompson Named Rheem Production Manager

Appointment of Norman E. Thompson as production manager for all plants of Rheem Manufacturing Co., has been announced by W. E. Curran, director and vice president in charge of manufacturing. Thompson joined Rheem in January 1943 as assistant manager for the Chicago plants. He became assistant to Curran in New York and later was made production manager for the eastern division.

Spann Returns to Gardner-Denver Co.

B. P. Spann, well known in publication circles as advertising manager of the Gardner-Denver Co., Quincy, Ill., has returned to the company after service of more than 38 months in the Navy.

Gosnell Joins Colonial

The Colonial Iron Works Co., Cleveland, announces that Everett C. Gosnell, formerly manager, chemical division, Lukens Steel Co., is now associated with the company as manager, chemical and process equipment division.

Collins in Charge of New Cleveland Office

The opening of a new Cleveland office of The General Detroit Corp. and The General Pacific Corp., is announced by E. A. Warren, vice president in charge of sales. The office is located at 912 Park Building.

Scott E. Collins, appointed zone sales manager in charge of the new office, has been with General Detroit for 4 years.

S. E. COLLINS

Jones Sales Development Manager for Caterpillar

Cornell E. Jones, formerly a major in the Army Corps of Engineers, has been named sales development manager of Caterpillar Tractor Co., Peoria, Ill., according to an announcement by H. H. Howard, general sales manager. He takes over the duties of Kenneth F. Park, recently named to the newly created post of engineering consultant on all matters pertaining to the earthmoving field.

English Goes to Casper For H. C. Smith

Appointment of Glen English as representative for H. C. Smith Oil Tool Co. in the Rocky Mountain area, was recently announced. He will make his headquarters at the company's branch office and warehouse at Casper, Wyo.

Plant Rubber Announces Appointment of Elsdon

Announcement that Hugh A. Elsdon, industrial insulation specialist, has been appointed to the Southern California division of the organization, is made by Plant Rubber & Asbestos Works, San Francisco.

McKinney Resumes Duties

Frank F. McKinney has resumed his duties at The Quaker Oats Co., Chicago, having been discharged from the Army after 2½ years of service in the Pacific. McKinney will supervise technical sales of the recently formed chemicals department.

Stanton Succeeds Watson As District Manager

Boyd Watson, district manager of the New York office of the Spang-Chalfant division of The National Supply Co., retired May 1 after 41 years with the division and its predecessor, Spang-Chalfant, Inc. W. J. Stanton, who has been with the company for 14 years, has succeeded Watson. Stanton was the company's liaison representative in Washington from 1941 throughout the war.

W. J. STANTON

Two Firms Effect License Arrangement

Wyatt Metal & Boiler Works, Houston and Dallas, announce an addition to their services as the result of a license arrangement entered into with General American Transportation Corp., Chicago, exclusive licensers

of the Wiggins tank roofs, for the sale, fabrication, erection, and servicing of this equipment in eight states throughout the oil country of the Mid-Continent and Southeast.

The Wyatt license territory includes the states of Arkansas, Oklahoma, New Mexico, Texas, Louisiana, Mississippi, and Alabama, and that part of Florida lying west of the Apalachiola River.

VanDyk Joins Petroleum Industry Sales Office

E. J. vanDyk has been appointed petroleum industry field engineer and district manager of sales for the Detroit Diesel Engine Division of General Motors Corp. The appointment is to the district which includes Oklahoma, Kansas, and Illinois. He will be located at Tulsa.

Homco Announces Personnel Changes

Houston Oil Field Material Co., Inc., recently announced the following personnel changes:

Paul Antoine, formerly a field representative for the Gulf Coast area, has been appointed city salesman for Houston. Antoine will be replaced in the field by Ray Chambliss, who was formerly in the Houston store.

Jack O'Neil has been transferred from the mud and chemical department in Odessa, Tex., to New Iberia, La., where he will be in the same department. Jack Stone will replace O'Neil in Odessa.

Joe Lawrence, back from the armed forces, has been assigned to Victoria, Tex.

Four Rejoin Tretolite

Woodrow Dickson has rejoined Tretolite Co. of California after 2½ years' service with the Army Air Forces. He is stationed in the research laboratory at Los Angeles. Carl Cooper has also returned to Tretolite after a hitch with the Army Air Forces, resuming his duties with the research division.

Irving Osburn is back in the field engineering department after 3 years in the U. S. Army Paratroops, and Lyman Cralle has returned to the manufacturing department after 3 years' service with the Army Air Forces.

Page Will Represent Franks in Southeast

L. R. Page has been appointed representative in the states of Arkansas, Louisiana, Mississippi, Alabama, Georgia, and Florida, for Franks Manufacturing Corp., Tulsa, according to an announcement by Carl White, Jr., president. Page's headquarters will be at Jackson, Miss.

Firm Changes Name

Hewitt Rubber Corp. has changed its name to Hewitt-Robins, Inc., thereby bringing in the identity of its wholly owned subsidiary, Robins Conveyors, Inc. The change was announced by Thomas Robins, Jr., president. All officers were reelected. Harold H. Von Thaden, first vice president of Robins Conveyors, was elected a director of Hewitt-Robins, Inc.

Meyer Sales Engineer in Charge of New York Office

N. E. MEYER

Appointment of N. E. Meyer as sales engineer of the Wilson-Snyder Manufacturing Division of Oil Well Supply Co., United States Steel subsidiary, is announced by Fred F. Murray, president. He will have charge of the division office in New York. Meyer joined the Wilson-Snyder organization 18 years ago, and has served in various capacities in the manufacturing, order and sales departments at the plant's home offices in Braddock, Pa.

Firm Moves Into New Building

General Machine & Supply Co., Wichita Falls, Tex., has moved into its new building at 702 West 2nd Street, Odessa, Tex.

The Odessa branch was opened several years ago to bring Le Roi products and service to the West Texas operators. The new building is a two-story, all-brick structure, and incorporates a suite of offices, a greatly enlarged stock of engines and parts, and a service shop completely equipped and staffed with factory-trained personnel.

Egelhoff With Titan at St. Louis

Titan Metal Manufacturing Co., Bellefonte, Pa., announces the appointment of Roy A. Egelhoff as sales representative for Iowa, Kansas, Missouri, Southern Illinois, and Southwestern Indiana, with offices at 817 Arcade Building, St. Louis.

Roebling Promotes Two

Announcement is made by John A. Roebling's Sons Co., Trenton, N. J., that

F. W. ROEBLING

C. M. JONES

Ferdinand W. Roebling, III, has been appointed vice president in charge of engineering. He succeeds Charles M. Jones, who has become vice president in charge of public and industrial relations. Both men are on the company's board of directors.

Hearn Transferred to Louisiana

E. B. (Eddie) Hearn, directional-drilling operator for Houston Oil Field Material Co., Inc., has been transferred to New Iberia, La., where he will be in charge of the directional drilling for the Louisiana-Mississippi district. F. R. Stapp will also be located in New Iberia, and will work with Hearn.

Heiple Rejoins LeTourneau

Returning to R. G. LeTourneau, Inc., for whom he first worked in 1938, Dan K. Heiple has rejoined the Peoria firm as a field engineer in the installation department. A graduate of Purdue University in 1941, he majored in mechanical and civil engineering. The installation department provides consultation service for owners and users of heavy earth-moving equipment.

Core Laboratories Appoint Two

Core Laboratories, Inc., announces the appointment of William E. Stiles as division engineer of the North and West Texas, Oklahoma, and Kansas divisions, with headquarters in Dallas. The company has appointed Gilbert A. Parks as assistant division engineer of the Rocky Mountain division.

Foote Bros. Appoints Maust

Foote Bros. Gear & Machine Corp., Chicago, announces the appointment of Irving C. Maust to the West Coast sales engineering staff. He will be located in Pasadena.

Davidson Retires From Emsco

W. D. (Steve) Davidson, director, vice president and chief engineer of Emsco Derrick & Equipment Co., retires on the first of June after 23 years of service with that company.

Clark With Dowell

Roscoe C. Clark is now employed by Dowell Incorporated as plastic and electrical well-logging engineer. A combat intelligence officer during the war, Roscoe saw 18 months of service in New Guinea, the Philippines, and Japan. He is a graduate of Tulsa University, and is a member of the Tulsa Engineers Club.

New Train to Coast

A new fast, nonextra-fare, transcontinental train and a slash of other train schedules between Chicago and the Pacific Coast of from 1 to 18⅔ hours, will become effective on June 2, according to an announcement by C. J. Collins, general passenger traffic manager of Union Pacific Railroad.

The new train, "The Transcontinental," to be operated jointly by Union Pacific, Chicago and North Western railroads, will handle through Pullman sleeping cars from New York and Washington, destined to Los Angeles, with a minimum layover in Chicago. In addition the train will also have day coaches, in which all seats will be reserved, from Chicago to Los Angeles.

Goetzinger Succeeds Wimmer

Resignation of A. C. Wimmer, treasurer of Oil Well Supply Co., United States Steel subsidiary, following 30 years' association with the company, is announced by Fred F. Murray, president. Wimmer has been succeeded by G. F. Goetzinger, formerly assistant treasurer.

Cook Elected Vice President

Gus Cook has been elected a vice president of Republic National Bank of Dallas. Cook, prior to his service in the Navy, was vice president and cashier, as well as a director, of Oak Cliff Bank & Trust Co.

Worthington Appoints Two

P. A. Alers has been appointed manager of the El Paso office of Worthington Pump & Machinery Corp. Alers has been connected with Worthington since 1933. The company also announces appointment of Andrew S. Ormsby as director of industrial relations. He was formerly in charge of industrial relations of Bendix Aviation Co.